

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

JANUARY, 1937.

$2s^1\Sigma \rightarrow 2p^1\Sigma$ Bands of the hydrogen molecule. G. H. DIEKE (Physical Rev., 1936, [ii], 50, 797—805).—Data for the $1X \rightarrow 2p^1\Sigma$ bands of H_2 are extended, and vals. for the newly discovered analogous systems of HD and D_2 are given. The upper level is identified unambiguously as $2s^1\Sigma$. Rotational structure data and vibrational consts. are tabulated, and perturbations are discussed. N. M. B.

Radiation damping and fine structure of the Balmer hydrogen line. J. MEIXNER (Ann. Physik, 1936, [v], 27, 389—404).—The deviations from the Sommerfeld fine-structure formula which are theoretically possible for the Balmer lines of H_2 and D_2 are considered, and their vals. derived. It is concluded that observed deviations arise from over-estimation of the accuracy of the methods employed, and are not real. A. J. M.

Radiation from a helium discharge tube with glowing cathode. E. D. DEVIATKOVA and N. D. DEVIATKOV (J. Tech. Phys. U.S.S.R., 1934, 4, 1855—1866).—Data are given for the amount of radiation at various $\lambda\lambda$ between 5000 and 11,000 Å., in the cathode region and positive column, and for its dependence on current (3—8 amp.). CH. ABS. (e)

Glow discharges in helium. K. G. EMELEUS, F. D. GREEVES, and E. MONTGOMERY (Proc. Roy. Irish Acad., 1936, A, 43, 35—47).—The negative glow and Faraday dark space of some cold-cathode discharges in He were studied with probes for gas pressures ≤ 0.4 mm. Hg. With pressure reduction the positive column showed characteristic changes accompanied by changes of electron velocity distribution in the negative glow. Results are plotted and discussed. N. M. B.

Energy losses of electrons in molecular nitrogen. J. E. ROBERTS, R. WHIDDINGTON, and E. G. WOODROOFE (Proc. Roy. Soc., 1936, A, 156, 270—283; cf. A., 1936, 771).—For the transition $X - a^1\Pi_u$ the nuclear separation is found to be 1.21 Å., rather than the val. 1.19 Å. deduced spectroscopically. L. L. B.

Zeeman effect for atmospheric oxygen bands. R. SCHMID, A. BUDÓ, and (in part) J. ZEMPLÉN (Z. Physik, 1936, 103, 250—262).—The behaviour of the 7660 Å. ($1\Sigma \leftarrow 3\Sigma$) band of O_2 in fields up to 26,000 gauss has been examined and is shown to be in agreement with theory. H. C. G.

Spectral intensities in the far ultra-violet and deduction of temperatures and pressures in vacuum sparks. H. A. ROBINSON (Z. Physik, 1936, 101, 658—660).—Vac. spark temp. previously

deduced (A., 1936, 916) agree with those of O IV in the Wolf-Rayet stars. A. B. D. C.

Excited atomic states investigated by the alternating illumination method. H. KREBS (Z. Physik, 1936, 101, 604—642).—The no. of excited Ne atoms in the positive column of a discharge tube has been measured. A. B. D. C.

Light excitation by corpuscular collision. K. GÄHLER (Z. Physik, 1936, 103, 303—314).—Mg vapour was excited with canal rays from H and He. A no. of Mg lines were emitted between 2778 and 5525 Å. Results are discussed in the light of Dopel's views on collision mechanism. H. C. G.

Influence of pressure on predissociation. W. LOCHTE-HOLTGREVEN (Z. Physik, 1936, 103, 395—413; cf. A., 1936, 411).—Two pressure effects are described. They are exemplified in the S_2 spectrum by two different predissociation regions. The energy of dissociation for the ground state of S_2 has an upper limit of 4.7 volts. A. E. M.

Determination of transition probabilities in the copper spectrum and a study of the metal arc. D. VAN LINGEN (Physica, 1936, 3, 977—994).—The relative intensities of ten Cu lines in a Ag arc of thermal type have been measured. The temp. of the arc was estimated by means of the CN band, 3884 Å., and transition probabilities for Cu levels are calc. O. D. S.

The $3\Pi_{1u}$ state and the absorption continuum of the bromine molecule. O. DARBYSHIRE (J. Chem. Physics, 1936, 4, 747—748).—Vibrational consts. of the Br mol. in the excited state between λ 6450 and 7600 Å. are given. The character of the absorption continuum is discussed. F. L. U.

Wave-length standards in the first spectrum of krypton. C. V. JACKSON (Phil. Trans., 1936, A, 236, 1—24).—Using two new types of étalon and carrier, $\lambda\lambda$ of 47 lines in the range 3424—6456 Å. have been compared with the Cd red line primary standard. There was no systematic relative variation, and results are accurate to 0.0001—0.0002 Å. Term vals. are calc. for 28 terms. The presence of impurities had no measurable influence on the $\lambda\lambda$, and results are identical for end-on or transverse observation. The pressure shifts (to the red) of 30 lines have been measured, and pressure shifts of many of the terms are calc. Full data are tabulated. N. M. B.

Absorption of iodine vapour at high temperatures. E. SKORKO (Acta Phys. Polon., 1934, 3, 191—196).—Comprehensive measurements of the

absorption spectrum of I for $\lambda\lambda$ 5000—2900 Å. at 800—1100°/0.1°—1000 mm. are recorded.

CH. ABS. (e)

Absorption spectrum of caesium. N. T. ZE and W. W. PO (Compt. rend., 1936, 203, 860—862).—In measurements at temp. up to 500° a no. of new lines of the absorption spectrum of Cs have been recorded and classified empirically.

J. W. S.

Visible fluorescence of mercury vapour. A. JASTLER (Ann. Physique, 1936, [xi], 6, 663—750).—A theoretical analysis of the mechanism of double excitation of Hg by 2537 and 4358 Å., leading to the emission of the visible fluorescence triplet 4046, 4358, and 5461 Å., is given. At high pressure the 2^3P_1 state is perturbed and the two excitation stages are incoherent; at low pressure the atom conserves its orientation and the stages are coherent. The degrees of polarisation of the fluorescence lines are calc. and are of opposite sign to the vals. in presence of N_2 . Results are in agreement with experimental data for intensities and degree of polarisation with natural and polarised excitation light.

N. M. B.

Extreme ultra-violet spectrum of mercury. L. BLOCH and E. BLOCH (Ann. Physique, 1936, [xi], 6, 561—574).—Full data for $\lambda\lambda$, intensities, and a provisional classification of spectral orders are tabulated for the region 1700—220 Å.

N. M. B.

Variation of shifts with the field in the Zeeman effect of mercury. P. JACQUINOT and G. DUPOUY (Compt. rend., 1936, 203, 779—782).

H. J. E.

Discharge potential in mercury vapour. K. F. NESTURCH (J. Tech. Phys. U.S.S.R., 1934, 4, 1844—1854).—The discharge potential was measured at 0—100°. The min. val. was 320 volts.

CH. ABS. (e)

Positive column in inert gas-mercury mixtures. K. SIEBERTZ (Ann. Physik, 1936, [v], 27, 421—458).—The effects observed under various conditions in a discharge tube containing Ne or A and Hg vapour have been investigated. The dependence of the temp.- and velocity-distribution of electrons on the v.p. of Hg in the tube is determined. The sudden strong appearance of the Ne spectrum as the pressure of Hg vapour is reduced, and the non-appearance of such a change in the discharge in A, are discussed and explained.

A. J. M.

Test of the interval rule in the $2D_{3/2}$ state of bismuth. I. E. U. MINTZ (J. Franklin Inst., 1936, 222, 613—623).—The hyperfine structure of the 4722 Å. line of the arc spectrum of Bi was investigated. Deviations from the Lande interval rule were found for the $2D_{3/2}$ state. These can be accounted for by the addition of a $\cos^2(ij)$ term to the interaction law.

A. J. M.

Regularities in the spectrum of the nuclei of comets. J. CABANNES and J. DUFAY (Compt. rend., 1936, 203, 903—905).—A classification of 29 lines of general occurrence in the spectra of the nuclei of comets is given.

A. J. E. W.

Stark effect in the rotation spectrum and electric susceptibility at high temperatures. S. K. CHAKRAVORTI (Z. Physik, 1936, 102, 102—111).—Theoretical.

A. B. D. C.

Primary potentials in a gas under pressure. B. I. VUL, I. M. GOLDMAN, and I. N. RASCHTSHEK-TAEV (J. Tech. Phys. U.S.S.R., 1934, 4, 299—306).

CH. ABS. (e)

Infra-red electron oscillations in the electric discharge. M. A. LEVITSKAJA (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 258—266).—The infra-red oscillations are explained on the basis of a layer of heavy negative ions, formed at a distance 10^{-5} — 10^{-6} cm. behind a layer of positive ions opposite the cathode.

CH. ABS. (e)

Electric discharge in gases investigated with the cloud chamber. R. HOLM (Z. Physik, 1936, 102, 138—142).—Polemical, against Flegler and Raether (A., 1936, 770).

A. B. D. C.

Probe test for positive space-charge. K. G. EMELEUS and W. L. BROWN (Phil. Mag., 1936, [vii], 22, 898—904).—A form of anomalous current-voltage characteristic curve for a double probe is associated with the existence of positive space-charge in the discharge investigated.

A. J. E. W.

Chemical reaction in electric discharges. I. Statistical theory of discharge reaction. K. G. EMELEUS and R. W. LUNT (Trans. Faraday Soc., 1936, 32, 1504—1512).—Expressions for the current and energy efficiencies of electron collision processes of the first kind in electrical discharges, derived by statistical treatment, exhibit analogous properties to the corresponding observed efficiencies of chemical reaction in a glow discharge.

A. J. E. W.

K X-Ray absorption spectra of some compounds of bromine, rubidium, and strontium. S. T. STEPHENSON (Physical Rev., 1936, [ii], 50, 790—792; cf. A., 1936, 656).—The K X-ray absorption of Br in solid AgBr and in each of the vapours MeBr, EtBr, and Br₂ was obtained. Edge widths and the positions of secondary fine structure are given and discussed. The small widths were checked by narrow K edges obtained for Rb in RbBr and Sr in SrCl, and agree with data on emission line widths. The effect of chemical combination on the λ -position of the main edge is discussed.

N. M. B.

X-Ray K-fluorescence yield. I. BACKHURST (Phil. Mag., 1936, [vii], 22, 737—752; cf. A., 1934, 351).—Measurements for Mo, Rh, Pd, Ag, Cd, Sn, Sb, Te, and Ba are recorded and discussed.

H. J. E.

Efficiency effect of X-ray K-fluorescence radiation for the elements carbon, nitrogen, oxygen, and neon. W. CRONE (Ann. Physik, 1936, [v], 27, 405—420).—The efficiency effect (u_K) (ratio of no. of quanta of fluorescence radiation to the no. of absorbed primary quanta) was ascertained for the above elements, the weak fluorescence radiation being determined by a method employing a counter-tube. The relative vals. obtained are converted into abs. vals. by a factor obtained by Haas (A., 1933, 332). The results agree with the theory of Wentzel, which requires $u_K \propto (\text{at. no.})^4$.

A. J. M.

Effects of chemical combination on the $K\beta$ lines of 26 Fe—30 Zn. J. C. McDONALD (Physical Rev., 1936, [ii], 50, 694—700; cf. Valasek, A., 1935, 1046).—The $K\beta$ lines of Fe, Co, Ni, Cu, and Zn from the sulphides were studied in fluorescence with a

Johansson-type focussing crystal spectrograph. The only lines showing a shift from their position in the spectra of the pure metals were the $K\beta_5$ lines of Fe and Ni. N. M. B.

Effects of chemical combination on X-ray emission spectra. J. C. McDONALD (Physical Rev., 1936, [ii], 50, 782; cf. preceding abstract).—The $K\beta$ lines of ^{26}Fe , ^{25}Mn , and ^{24}Cr in Fe_2O_3 , KMnO_4 , and $\text{K}_2\text{Cr}_2\text{O}_7$ were photographed. Results do not confirm those of Tanaka (cf. A., 1935, 556). Preliminary data on the $K\alpha_1$, $K\beta''$, and $K\beta_5$ lines are reported (cf. Valasek, *ibid.*, 1046). N. M. B.

Photo-electric sensitisation of potassium by means of hydrogen. J. J. BRADY and J. H. ROCHÉL (Physical Rev., 1936, [ii], 50, 870).—Using an atom gun, the sensitisation was studied as a function of film thickness for the range 0.5–5 mol. layer. The sensitivity of very thin films is destroyed permanently by H_2 , due to the formation of KH . A strong selective photo-electric effect appears if a small deposit of K is made on the KH , indicating that the effect is due to isolated K atoms held away from the underlying metal surface (cf. Zener, A., 1935, 273). The influence of the H_2 decreases slightly with increasing K film thickness. N. M. B.

Positive and negative thermionic emission from tungsten. H. B. WAHLIN and L. V. WHITNEY (Physical Rev., 1936, [ii], 50, 735–738; cf. Moon, A., 1932, 1185).—The spectral emissivity, for $\lambda = 0.669 \mu$, of thoroughly outgassed W had a const. val. 0.46 over 1200–2200° abs. The heat of evaporation of neutral atoms was 8.44 e.v. The electron work function was 4.55 for $A = 75$ and 4.63 e.v. at 3100° abs., for $A = 212$ amp. per sq. cm. per degree². The average positive ion work function was 11.93 e.v. N. M. B.

Free energy of electron gas. A. R. GORDON (J. Chem. Physics, 1936, 4, 678–679).—The energy and free energy of a semi-degenerate gas obeying Fermi statistics are calc. as functions of temp. and concn. The degree of thermal ionisation of K vapour under high electron concn. is evaluated. The result shows the significance of the deviations of the free energy from the limiting high-temp. val. W. R. A.

Ionisation of atoms of alkali metals on the surface of tungsten, molybdenum, and thoriated tungsten. L. N. DOBRETZOV (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 783–795).—The Langmuir-Saha law is followed for Na on W and Mo. CH. ABS. (e)

Collision ionisation processes in gases investigated with the cloud chamber. E. FLEGLER and H. RAETHER (Z. Physik, 1936, 103, 315–336).—A modification of the cloud chamber is used to photograph condensation produced by ionisation between two electrodes which can be charged and discharged in a measured time. The effect of strongly illuminating the space between the electrodes has been examined. H. C. G.

Thermal theory of cathode sputtering and the emission of secondary electrons. N. D. MORGULIS (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 499–506).—Theoretical. CH. ABS. (e)

Depth at which secondary electrons are liberated. H. BRUINING (Physica, 1936, 3, 1046–1052).—The variation of secondary electron emission from Ni and C-coated Ni targets with the angle of incidence, θ , of the primary beam is followed for velocities of primary electrons up to 600 volts. With a rough target there is little dependence on θ . The secondary emission from a smooth target increases with θ . It is deduced that the secondary electrons are liberated in Ni at a depth of about 30 Å. O. D. S.

Experimental determination of free wavelength of electrons in lead and cadmium. A. EUCKEN and L. RIEDEL (Naturwiss., 1936, 24, 696).—In a wire, the diameter of which is commensurate with the free λ of electrons (1μ), λ is $<$ for thicker wires. Hence it is possible to derive λ from the increase of sp. resistance of very thin wires. The val. for Pb is 62.5 Å., and for Cd 292 Å. The no. of free electrons per atom is 1 and 0.34, respectively. A. J. M.

New effect observed on passing electron beams through narrow slits. W. McFARLANE (Phil. Mag., 1936, [vii], 22, 801–810).—The beam emerging from a 0.1-mm. slit had a band-like structure, arising from the distribution of electric charges on the slit edge. H. J. E.

Emission of electrons by the sun and its relation to terrestrial magnetic phenomena. D. BARBIER (Compt. rend., 1936, 203, 920–922).—A theory accounting for the emission of electrons of certain velocities by the sun, causing terrestrial magnetic disturbances, is discussed. A. J. E. W.

Emission of positive electrons from a radioactive substance. A. I. ALICHOV and M. S. KOZODAEV (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 531–544).—Positive electrons were emitted from Pb by the action of monochromatic γ -rays, or $\text{Ra-B} + \text{C}$ radiation; 2 mm. of Al practically stopped them. CH. ABS. (e)

Anomalous charge phenomena on ionic collisions, with dissonance. F. WOLF (Ann. Physik, 1936, [v], 27, 543–572; cf. A., 1935, 1048, 1294; 1936, 1042).—The variation of charging cross-section with velocity (30–1020 volts) of ions was determined for 11 different collision processes between H_2 , N_2 , He, Ne, and A, and their ions. There are considerable deviations from theory, and a type of Ramsauer effect was observed. The Kallmann-Rosen resonance principle is obeyed in the main in charging processes. A. J. M.

Secondary emission from copper due to slow positive ions of argon. F. L. JONES and W. H. WILLOTT (Proc. Physical Soc., 1936, 48, 830–838).—In order to determine whether positive ions drifting on to an electrode can liberate electrons when the ion energy is $>$ that of the surrounding gas, the secondary emission from a Cu cathode due to A ions moving in A under weak electric fields was measured. No emission was detected for electric intensity $Z < 20$ volts per cm. and $Z/p < 40$, but emission was about 1.1% for $Z > 60$, corresponding with $Z/p > 100$. N. M. B.

Mass-spectrographic analysis of the ions produced in HCl under electron impact. A. O.

NIER and E. E. HANSON (Physical Rev., 1936, [ii], 50, 722—726).—The ions observed were HCl^+ , HCl^{2+} , H^+ , Cl^+ , Cl^{2+} , Cl^{3+} , Cl^{4+} , Cl^{5+} , and Cl^- . When He and Ne were used as calibrating gases the appearance potentials were: HCl^+ , 12.9 ± 0.2 ; HCl^{2+} , 35.7 ± 1.0 ; H^+ , 18.6 ± 0.3 and 28.4 ± 0.3 ; Cl^+ , 17.2 ± 0.5 and 21.2 ± 0.5 ; Cl^{2+} , 45.7 ± 0.3 ; Cl^{3+} , approx. 160; Cl^- , approx. 1.6 volts. Efficiency of ionisation curves are given, and from the ratio of the H^{35}Cl to H^{37}Cl peak heights the abundance ratio $^{35}\text{Cl}/^{37}\text{Cl}$ is 3.07 ± 0.03 . ^{39}Cl , if present, was < 1 per 20,000 of ^{35}Cl . N. M. B.

New process of negative ion formation. F. L. ARNOT and J. C. MILLIGAN (Proc. Roy. Soc., 1936, A, 156, 538—560).—Negative ions are formed in Hg vapour, produced by positive ions capturing two electrons from electrodes on which they impinge. This new process is a radiationless one having a comparatively high probability of occurrence, and probably occurs in other vapours and gases. The interpretation of previous work on negative ions may require modification. L. L. B.

Ubiquity of the chemical elements. I. NODDACK (Angew. Chem., 1936, 49, 835—841; cf. A., 1936, 184, 186).—A discussion. F. L. U.

Relative abundance of the isotopes in Mn, Nb, Pd, Pt, Ir, Rh, and Co. M. B. SAMPSON and W. BLEAKNEY (Physical Rev., 1936, [ii], 50, 732—735).—Using a new type of W filament ion source abundances of Pd, Ir, and Pt isotopes were measured, and at. wts. deduced. Mass nos. and % abundances (in parentheses) are: Pd, 102 (0.8), 104 (9.3), 105 (22.6), 106 (27.2), 108 (26.8), 110 (13.5); Ir, 191 (38.5), 193 (61.5); Pt, 192 (0.8), 194 (30.2), 195 (35.3), 196 (26.6), 198 (7.2). The calc. at. wt. of Ir is 192.2 (chemical val. 193.1). Analysis confirmed the simple nature of Mn and Nb. Evidence for the existence of 1 part of ^{101}Rh in 1300 of ^{103}Rh , and 1 part of ^{57}Co in 600 of ^{59}Co , was obtained. N. M. B.

Geologic time and isotopic constitution of radiogenic lead. J. L. ROSE and R. K. STRANATHAN (Physical Rev., 1936, [ii], 50, 792—796; cf. A., 1936, 1043).—The isotopic constitutions of Pb from ores from various localities were found from densitometer measurements of the hyperfine structure of $\lambda 5372$. The probable geologic ages of the minerals, calc. from the Ac-D/Ra-G ratios, agree, with one exception, with the ages from Pb/U ratios. N. M. B.

β -Ray activity of radioactive bodies. M. N. SAHA and D. S. KOTHARI (Bull. Acad. Sci. U.P., 1934, 3, 257—268).—Theoretical. CH. ABS. (e)

Emission of β -rays from substances bombarded with neutrons. S. KIKUCHI, H. AOKI, and K. HUSMI (Nature, 1936, 138, 841).— β -Rays are emitted from metals during bombardment by fast neutrons. The effect of ordinary induced radioactivity is excluded, since no activity remained after the bombardment. New types of interaction of neutrons with atoms must be assumed to explain the effects observed. L. S. T.

Fermi theory of beta decay. W. G. POLLARD (Phil. Mag., 1936, [vii], 22, 904—920).—Theoretical. A. J. E. W.

Primary ionisation of high-energy electrons in nitrogen and neon. H. K. SKRAMSTAD and D. H. LOUGHRIDGE (Physical Rev., 1936, [ii], 50, 677—681).—An expansion-chamber study was made of the tracks of high-energy β -rays produced by bombarding a Pb screen inside the chamber with Rn γ -radiation. The no. of primary ions per cm. of path at n.t.p. in N_2 is given by $I = 19\beta - 1.15 \pm 0.15$, and in Ne by $I = 12.6\beta - 1.35 \pm 0.15$, where β is the velocity of the β -ray in light-velocity units. Results are in general agreement with theory. N. M. B.

γ -Radiation of the uranium-X complex. G. J. SIZOO and D. J. COUMOU (Physica, 1936, 3, 921—935; cf. A., 1935, 1048).—Absorption of the γ -radiation of U-X was investigated in Al, Cu, Sn, and Pb up to absorption thicknesses of 27.4, 87.0, 65.2, and 104.4 g.-cm.⁻², respectively. Analysis of the absorption curves for different metals leads to different vals. for the no. of components of the radiation, their λ and relative intensities. It is concluded that the γ -radiation contains a large no. of components and is probably continuous. The effective λ of the strongly filtered U-X radiation is 7.3 X. O. D. S.

Ionisation method for the absolute measurement of γ -ray energy. L. H. GRAY (Proc. Roy. Soc., 1936, A, 156, 578—596).—The relation $E_\gamma = J_e W \rho$ is shown to hold, where E_γ is the γ -ray energy absorbed per unit vol. of the medium, J_e is the ionisation per unit vol. produced in the gas, W is the average energy lost by the secondary electrons per pair of ions formed in the gas, and ρ is the ratio of the stopping power of the medium and the gas for the secondary electrons. ρ is almost const. over a wide range of electron energies. W for air = 32—33 volts per ion pair. L. L. B.

Production and absorption of thermal energy neutrons. G. A. FINK (Physical Rev., 1936, [ii], 50, 738—747).—From measurements of the no. of neutrons reduced to thermal energies in successive cylindrical layers of H_2O the rate of absorption of the thermal energy neutrons in the H_2O , corr. for the rate of production, was calc. Similar experiments with C, Al, Cu, Fe, and SiO_2 were performed. The estimated total no. of neutrons emitted from a Rn-Be source was of the order 15,000 per sec. per mc. The angular distribution of slow neutrons from the surface of paraffin spheres was more cone. along the normal than a cosine law distribution. A slow neutron source giving a roughly collimated beam is described. Measurements of the absorption of neutrons having slightly $>$ thermal energy showed that Hg is nearly transparent and that Rh and Ag had less absorption than for thermal neutrons. With a neutron source at liquid air temp. increased absorption is shown by H, Li, B, Rh, Ag, I, Gd, and Hg, but practically no change by Sm and Cd. The construction and use of mechanical velocity selectors for slow neutrons are discussed. N. M. B.

Disintegration of nitrogen by fast neutrons. T. W. BONNER and W. M. BRUBAKER (Physical Rev., 1936, [ii], 50, 781; cf. A., 1936, 773).—Data on neutron energies and corresponding energy appearing at the disintegration forks are discussed and tabulated.

The val. of Q_1 in the reaction $^{14}\text{N} + {}_0^1n \rightarrow {}^{11}\text{B} + {}^4\text{He} + Q_1$ is -0.3 m.e.v. The disintegrations may be explained by assuming that the ^{11}B nuclei are left excited to either of the known excitation levels 4.5 or 6.8 m.e.v., and not by the radiative capture theory.

N. M. B.

Scattering of neutrons in matter. II. L. S. ORNSTEIN (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 904–905; cf. A., 1936, 1441).—Mathematical. The frequency law for the energy in the case of neutron capture is discussed.

J. G. A. G.

(A) **Scattering of protons by protons.** M. A. TUVE, N. P. HEYDENBURG, and L. R. HAFSTAD. (B) **Theory.** G. BREIT, E. U. CONDON, and R. D. PRESENT (Physical Rev., 1936, [ii], 50, 806–825, 825–845; cf. White, A., 1936, 400).—(A) The no. of protons scattered or projected by recoil through angles 15 – 45° from a mono-energetic proton beam in passing through 2 mm. path of H_2 at 12 mm. pressure was determined by counting for proton beam energies of 600, 700, 800, and 900 kv. The no. scattered at all angles shows a divergence from the val. predicted by Mott's formula, increasing progressively with voltage. Measurements of proton scattering by D_2 , He, and air, with "vac. scattering" tests, indicate that the anomaly is due, not to contamination, but to a proton-proton interaction at close distances ($< 5 \times 10^{-13}$ cm.) involving a departure from ordinary Coulomb forces. Data are plotted graphically.

(B) **Mathematical.** The above results are discussed and interpreted on the basis of wave-mechanics.

N. M. B.

Bibliography of artificial transformations. G. FEA (Nuovo Cim., 1935, 12, 368–406; Chem. Zentr., 1936, i, 954).

H. J. E.

Artificial radio-elements produced by neutron bombardment. Elements beyond uranium. O. HAHN (Ber., 1936, 69, [A], 217–227).—A lecture.

γ -Rays of lithium and fluorine under α -particle bombardment. K. C. SPEER (Physical Rev., 1936, [ii], 50, 689–694).—The energies of the γ -rays from Li and F under bombardment by Po α -particles of range 0–3.9 cm. was determined in relation to the energy of the incident particle. The Li γ -rays showed no change of energy as the α -particle range was reduced from 3.9 to 2.5 cm., indicating that the radiation results from excitation of the Li nucleus without capture of the α -particle. At 3.9 cm. incident range the F γ -radiation consists of two components, the harder disappearing when the range is reduced to 3.1 cm.

N. M. B.

Disintegration experiments on the separated isotopes of lithium. L. H. RUMBAUGH and L. R. HAFSTAD (Physical Rev., 1936, [ii], 50, 681–689).— ^6Li emits two groups of protons with mean energy ranges 25.4 and 29.6 cm. under deuteron bombardment at 540 kv., and neutrons at ≤ 300 kv. ^7Li gives short-period β -ray activity under deuteron bombardment at ≤ 500 kv., and γ -rays at around 450 and 1000 kv.

N. M. B.

Artificial radioactivity produced in magnesium by α -particles. C. D. ELLIS and W. J. HENDERSON (Proc. Roy. Soc., 1936, A, 156, 358–

367; cf. A., 1936, 6).—By studying the effects produced by α -particles of different energies, information is obtained about the resonance levels of the three Mg isotopes. The probability of ejecting protons from ^{24}Mg , ^{25}Mg , and ^{26}Mg is in the ratio 500:30:1 (approx.). The electrons from ^{29}Al are faster than those from ^{28}Al , although the latter has the shorter period. This is interpreted as showing that $^{28}\text{Al} \rightarrow ^{28}\text{Si}$ is a permitted transition without change of spin, but that $^{29}\text{Al} \rightarrow ^{29}\text{Si}$ is non-permitted and involves a change of spin.

L. L. B.

Internal conversion in aluminium. H. P. DE (Sci. and Cult., 1935, 1, 60).—During a cloud-chamber investigation of positron emission from Bi, a positron pair of tracks, originating in an Al sheet, was photographed. The energies of the two particles were approx. equal.

CH. ABS. (e)

Collisions of α -particles with sulphur nuclei. R. L. ANTHONY (Physical Rev., 1936, [ii], 50, 726–732).—More than 700,000 Th-C and -C' α -particle tracks in a cloud chamber filled with H_2S – H_2 were photographed stereoscopically, and a range-velocity curve for S recoil atoms is constructed and discussed. No collisions indicating possible S disintegrations were observed. The calc. distances of closest approach are compared with the radius of the S nucleus (cf. Brasefield, A., 1936, 1173).

N. M. B.

Artificial radioactivity of scandium. G. HEVESY (Kong. dansk. Vid. Selsk. mat.-fys. Medd., 1935, 13, No. 3, 15 pp.; Chem. Zentr., 1936, i, 955).—The following processes were observed: $^{41}\text{Sc} + \frac{1}{2}n \rightarrow ^{42}\text{K} + \alpha$; $^{46}\text{Sc} + \frac{1}{2}n \rightarrow ^{46}\text{Sc}$. has a half-life of 16 hr. and emits β -rays with an absorption coeff. of 10 cm. $^{-1}$ in Al. ^{46}Sc has a half-life of some years and emits very soft rays. and ^{41}Sc form, respectively, ^{42}Ca and ^{46}Ti , which are stable isotopes. The radioactivity of K is discussed.

H. J. E.

Radioactive isotopes of nickel and copper. C. B. MADSEN (Nature, 1936, 138, 722).—Radioactive nickel of 100 min. period has been isolated as oxide from Zn bombarded by neutrons. Two active isotopes, possibly ^{63}Ni and ^{64}Ni , may exist. Radioactive Cu, produced during the same irradiation, has a 17-hr. period. Attempts to isolate active Cl from irradiated K failed.

L. S. T.

Evidence for the expulsion of two neutrons from copper and zinc by one fast neutron. F. A. HEYN (Nature, 1936, 138, 723).—The activities of Cu and Zn bombarded by neutrons from different sources are recorded. With fast neutrons from Li + ^2H , Cu emits positrons of 10.5-min. period. Probable reactions with fast neutrons are $^{63}\text{Cu} + {}^1_0n \rightarrow ^{62}\text{Cu} + 2^1_0n$, $^{62}\text{Cu} \rightarrow ^{62}\text{Ni} + e^+$ and $^{66}\text{Zn} + {}^1_0n \rightarrow ^{65}\text{Zn} + 2^1_0n$, $^{65}\text{Zn} \rightarrow ^{65}\text{Cu} + e^+$. Capture of a slow neutron gives the same Zn isotope, $^{64}\text{Zn} + {}^1_0n \rightarrow ^{65}\text{Zn}$.

L. S. T.

Activation of thulium by slow neutrons. M. CURIE and P. PREISWERK (Compt. rend., 1936, 203, 787–788).—A product with a half-period of approx. 8 months was obtained ($^{169}\text{Tm} + \frac{1}{2}n = ^{170}\text{Rd(Tm)}$). The product of disintegration was ^{170}Yb .

H. J. E.

Diurnal variation of cosmic-ray intensity. J. L. THOMPSON (Physical Rev., 1936, [ii], 50, 869).—

Calculations of the % variation in total intensity of cosmic rays due to diurnal variation in the horizontal component of the earth's magnetic field indicate that fluctuations in the earth's field are unlikely to influence cosmic-ray intensities. N. M. B.

Coincidence counter measurements of cosmic rays in an aeroplane. H. J. BRADDICK and A. W. GILBERT (Proc. Roy. Soc., 1936, A, 156, 570—577).—Cosmic-ray measurements have been made in an aeroplane at 30,000 ft. (220 mm.). The showers increase with altitude much more rapidly than the vertical intensity. L. L. B.

Hard secondary radiation of ultra-radiation. H. MAASS (Ann. Physik, 1936, [v], 27, 507—531).—Coincidence experiments with several counter tubes arranged one above the other and absorbing layers of Fe between or above the tubes indicate the existence of a penetrating radiation with a range of approx. 35 cm. Fe. The absorption curve gives absorption coeff., ν , of 0.08 cm.^{-1} Fe. The absorption coeff., μ , of the radiation emitted by the action of the secondary radiation is $(9 \pm 4) \times 10^{-3} \text{ cm.}^{-1}$ Fe. A. J. M.

Cosmic-ray burst at a depth equivalent to 800 m. of water. Y. NISHINA and C. ISHII (Nature, 1936, 138, 721—722).—Measurements in the Simidu tunnel of Japan show that cosmic rays pass through > the equiv. of 800 m. of H_2O . L. S. T.

Absorption of cosmic-ray secondaries and showers. D. K. FROMAN and J. C. STEARNS (Physical Rev., 1936, [ii], 50, 787—789).—Absorption measurements in Pb and Al, using a triple Geiger-Müller system with the three counters in a vertical line, are reported. N. M. B.

"Showers" in cosmic rays. W. HEISENBERG (Z. Physik, 1936, 101, 533—540).—Fermi's theory of β -ray disintegration explains production of "showers" by cosmic rays. A. B. D. C.

Range of the constituent particles of bursts of ultra-penetrating rays. N. IVANOVA (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 49—52).—The range of constituent particles of bursts produced in Pb has been estimated from measurements of the effect of interposing different thicknesses of Al. Results do not agree with the conclusions of Geiger and Fünfer (A., 1935, 426). The bursts contain a group of particles with range > 16 mm. Pb. O. D. S.

Cosmic cyclotron as a cosmic ray generator? H. ALFVÉN (Nature, 1936, 138, 761).—A double star may constitute a gigantic cyclotron which gives cosmic rays with energies of the correct order of magnitude. L. S. T.

Diffusion of light by neutrons. J. SOLOMON (Compt. rend., 1936, 203, 926—928).—Application of the Fermi neutrino theory indicates the possibility of diffusion of light due to neutrons. A. J. E. W.

Orbital neutrons. G. N. LEWIS (Physical Rev., 1936, [ii], 50, 857—860).—An alternative theory of capture of slow neutrons by atoms is suggested in which, owing to the interaction between the spin of the nucleus and the spin of the neutron, there is a field outside the nucleus in which neutrons can be held in

quantised "orbits." Probability conditions for capture in a particular orbit are discussed. N. M. B.

Possibility of detecting neutrinos. D. S. KOTHARI (Sci. and Cult., 1935, 1, 58).—It is proposed to detect neutrino emission by absorbing β radiation in Pb, and allowing neutrinos which penetrate the Pb to liberate neutrons from paraffin. CH. ABS. (e)

Spin-orbit coupling in nuclei. D. R. INGLIS (Physical Rev., 1936, [ii], 50, 783).—Theoretical. N. M. B.

Introduction of non-electric forces into Dirac's equations. W. H. FURRY (Physical Rev., 1936, [ii], 50, 784—785; cf. preceding abstract).—Mathematical. The doublet separations of nuclear energy levels are considered in relation to Dirac's equations. N. M. B.

Structure of the photon. T. V. IONESCU (Compt. rend., 1936, 203, 864—867; cf. A., 1936, 1312).—Mathematical. J. W. S.

Photons and particles of pure charge. A. PROCA (Compt. rend., 1936, 203, 709—711).—Theoretical. The possible existence of particles of charge e and zero rest mass is envisaged, such particles constituting photons. A. J. E. W.

Collision of neutron and proton. P. M. MORSE, J. B. FISK, and L. I. SCHIFF (Physical Rev., 1936, [ii], 50, 748—754).—An exact solution is found for the bound and free states of a neutron-proton pair under the influence of a potential field. Vals. of binding energy (for the deuteron), elastic and capture cross-sections, and cross-sections for the photo-electric disintegration of the bound state are calc. and plotted for a wide range of the parameters used. Comparison of results with experiment allows a choice of relations between parameters. N. M. B.

Nuclear forces. M. A. TUVE (Physical Rev., 1936, [ii], 50, 869).—The term "force of levity" is advocated to denote attractive forces inside at. nuclei in contrast to the force of gravity. N. M. B.

Nuclear forces. B. CASSEN and E. U. CONDON (Physical Rev., 1936, [ii], 50, 846—849).—A formalism for a unified description of the various types of exchange forces used in nuclear structure theories is developed. N. M. B.

Possibility of the same form of specific interaction for all nuclear particles. G. BREIT and E. FEENBERG (Physical Rev., 1936, [ii], 50, 850—856).—Mathematical. A provisional equation for all cases is postulated and discussed. N. M. B.

Simple nuclear model. K. BECHERT (Z. Physik, 1936, 101, 721—731; 103, 276).—Theoretical. A. B. D. C.

Estimation of electron affinities of He, Li, and F. T. WU (Phil. Mag., 1936, [vii], 22, 837—846).—Li in the normal state has an electron affinity of approx. 0.54 e.v. That of He in the $1s\ 2s^3S$ state is very small: in the $2s^2\ ^1S$ state it is approx. 33 e.v. The val. for F is approx. 4.1 e.v. H. J. E.

Magnetic spin interaction between two particles. S. A. ALTSHULER (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 244—249). CH. ABS. (e)

Magnetic interaction in the deuteron. H. B. G. CASIMIR (*Physica*, 1936, 3, 936—938).—Mathematical. It is calc. that magnetic interaction between proton and neutron would give rise to an energy difference of approx. 10^5 e.v. between the lowest triplet and the lowest singlet state of the deuteron, the singlet state being the lowest. O. D. S.

Interaction of heavy particles. D. IVANENKO and A. SOKOLOV (*Z. Physik*, 1936, 102, 119—131).—Theoretical. A. B. D. C.

Theory of the deuteron. T. SEXL (*Naturwiss.*, 1936, 24, 651).—The equation derived by Ivanenko *et al.* (preceding abstract) for the interaction of the deuteron and the electron-neutrino field is used to calculate the binding energy of the deuteron. A. J. M.

Interaction of light nuclei. III. Binding energies of ^4He , ^5He , ^6Li , and of nuclei of the type $4n$. H. S. W. MASSEY and C. B. O. MOHR (*Proc. Roy. Soc.*, 1936, A, 156, 634—654; cf. A., 1936, 266).—Mathematical. Two-body forces of the same range are assumed between neutrons and protons, neutrons and neutrons, and protons and protons. The observed masses of the nuclei considered are consistent if the range of interaction between the particles is $1.7\text{--}2.2 \times 10^{-13}$ cm. and the attraction between like particles is 0.2—0.3 of that between unlike particles. ^5He is probably unstable. L. L. B.

Second-order spin effects in ^3H . R. D. PRESENT (*Physical Rev.*, 1936, [ii], 50, 870—871). Mathematical. The energy lowering is of the order $0.5 mc^2$. N. M. B.

Influence of a magnetic field on the hydrogen atom. E. SEVIN (*Compt. rend.*, 1936, 203, 846—848).—Mathematical. J. W. S.

Ionisation, excitation, and chemical reaction in uniform electric fields. I. Townsend coefficient of ionisation. K. G. EMELEUS, R. W. LUNT, and C. A. MEEK (*Proc. Roy. Soc.*, 1936, A, 156, 394—411).—An attempt is made to calculate the vals. of Townsend's coeff. of ionisation αp^{-1} in various gases, employing the experimental results on the abs. efficiencies of ionisation by electrons of known energy (A., 1932, 321), the ratio of the mean energy of the electron swarm to the thermal energy of the gas, and the drift velocity of the swarm. Good agreement with experimental results over a wide range of Xp^{-1} (except for low vals.) is found for diat. gases, by assuming a Maxwellian distribution. L. L. B.

Interactions of electromagnetic fields. B. PODOLSKY (*Phil. Mag.*, 1936, [vii], 22, 998—1002).—Theoretical. A. J. E. W.

Generalisation of the Lorentz transformation for a system of corpuscles. J. DESTOUCHES (*Compt. rend.*, 1936, 203, 924—926).—Mathematical. A. J. E. W.

Ionic space charge and its neutralisation by electrons. N. D. MORGULIS (*J. Exp. Theor. Phys.* U.S.S.R., 1934, 4, 489—498). CH. ABS. (e)

Conservation of energy and Shankland's experiment. F. CERNUSCHI (*Compt. rend.*, 1936, 203, 777—779). H. J. E.

Photographic application of a method of amplifying the energy of photons. A. LALLEMAND (*Compt. rend.*, 1936, 203, 990—991).—Acceleration of photo-electrons by an electric field enables light of very low intensity to be detected photographically. A. J. E. W.

Far ultra-violet absorption spectrum of N_2O . A. B. F. DUNCAN (*J. Chem. Physics*, 1936, 4, 638—641).—Below 1550 Å. discrete systems of bands and some continuous regions of absorption are found; below 997 Å. there are no bands. A Rydberg series is found, converging to an ionisation potential of 12.66 volts. Evidence is given for a total of 10 electronic states including the members of the Rydberg series. W. R. A.

Ultra-violet absorption spectrum of ammonia. III. Absorption spectra of the deuterio-ammonias. Rydberg series in ammonia. A. B. F. DUNCAN (*Physical Rev.*, 1936, [ii], 50, 700—704; cf. A., 1936, 404).—The absorption spectrum of ND_3 , ND_2H , and NDH_2 mixtures was photographed for the range 2200—800 Å. with a normal-incidence vacuum spectrograph. The spectrum above 1675 Å. is made up of very diffuse bands; below this all the bands are sharp. Between 1675 and 1220 Å. two electronic transitions are found, each accompanied by many vibrational transitions. There is evidence of a fourth electronic state below 1220 Å. Only one excited state frequency appears for each mol. Frequencies, and the electronic terms for excited states, are calc. A possible Rydberg series in ammonia is discussed. N. M. B.

Absorption spectra of sulphur dioxide and hydrogen sulphide in the Schumann region. L. BLOCH, E. BLOCH, and P. HERRENG (*Compt. rend.*, 1936, 203, 782—784).—Measurements are recorded for the absorption bands of SO_2 and H_2S at $\lambda\lambda$ 1988—1793 and 1600—1273 Å., respectively. H. J. E.

Radicals of OH in the electric discharge in water vapour. V. KONDRATEEV and M. ZISKIN (*Acta Physicochim.* U.R.S.S., 1936, 5, 301—324).—The sensitivity of the absorption spectra method for measuring small concns. of gases has been increased by substituting a discontinuous for a continuous light source. The new method has been applied to the study of OH radicals obtained in the electric discharge, a discharge in H_2O vapour being used as the light source. The absorption is very strong for lines with small rotational quantum nos., indicating that the temp. of the OH radicals is not high, the calc. vals. being approx. 120° and 200° with discharge currents of 0.5 and 2 amp., respectively. Assuming that the absorption coeff. of the OH mol. is of the same order of magnitude as that of the Na D line, the concn. of OH radicals corresponds with partial pressures of the order of 10^{-5} to 10^{-4} mm. of Hg. C. R. H.

Band spectra of SiH and SiD. G. D. ROCHESTER (*Z. Physik*, 1936, 101, 769—784).—Rotational analysis provides mol. constns. for SiH and SiD. A. B. D. C.

Ultra-violet systems of the emitters GeCl and GeBr [and SiBr]. L. A. BASHFORD, H. V. A.

BRISCOE, and W. JEVONS (Nature, 1936, **138**, 883—884).—Analyses of these band systems are recorded and discussed. L. S. T.

Optical dissociation of the lead halides. B. POROV and H. NEUMIN (J. Phys. Chem. U.S.S.R., 1934, **5**, 863—884).—Excitation of Pb halides with $\lambda\lambda$ 1850—2300 Å. caused emission of a visible band spectrum of the Pb monohalide mol., a spectrum of the halogen mol., and a line spectrum of Pb. Heats of dissociation calc. from the spectral data are recorded. CH. ABS. (e)

Absorption and energy bands of alkali halide crystals. A. SMEKAL (Z. Physik, 1936, **101**, 661—679).—Inhomogeneous elastic distortion of a lattice gives unsymmetrical broadening of energy bands; this is reflected in unsymmetrical absorption bands. A. B. D. C.

Optical absorption by the alkali halides. J. C. SLATER and W. SHOCKLEY (Physical Rev., 1936, [ii], **50**, 705—719).—Relations are investigated between theories for explaining absorption of light by ionic crystals by independent atoms or ions, according to Frenkel's excitation waves, and according to energy bonds and lattice functions as used in the theory of metals. The set of unperturbed wave functions obtained in each case is not correct at the actual distance of separation in the crystal, and combinations must be used. Results are compared with experiment. N. M. B.

Spectroscopy of ionic crystals and its application to alkali halides. A. VON HIPPEL (Z. Physik, 1936, **101**, 680—720).—Systematic application of the spectroscopy of ionic crystals to alkali halides explains the first max. of the ultra-violet absorption, the band structure of the ultra-violet absorption, photoelectric effect and inner potential, the absorption spectrum in the far ultra-violet, electron exchange bands, additive colouring, the "O" bands, and phosphorescence. Three groups of electron transitions are required: from halogen ions to the ideal lattice, from alkali or halogen atoms to cations, to the lattice, or to one another, and finally these transitions may take place to a deformed locality of the lattice. A. B. D. C.

(A) Diffuse bands in the absorption spectrum of thallos chloride vapour. (B) Optical excitation of the thallium spectrum in its halide salt vapours. H. NEUMIN (J. Exp. Theor. Phys. U.S.S.R., 1934, **4**, 692—696, 697—708).—(A) The absorption spectrum of TlCl at 600°/1 mm. shows two bands with max. at 3110 and 2510 Å. They are of the type found by Kuhn (A., 1930, 1089) for alkali halides.

(B) Irradiation of TlCl, TlBr, and TlI vapour at 600°/100 mm. with light from the Al, Fe, or Ni spark excites the 3776 and 5351 Å. resonance lines of at. Tl produced by thermal dissociation. Pure Tl vapour shows the same lines on irradiation, but only at a higher temp. Addition of HgBr₂ increases the intensity of the at. lines. CH. ABS. (e)

Electron affinity spectrum of ferrous ion in aqueous solution. R. H. POTTERILL, O. J. WALKER, and J. WEISS (Proc. Roy. Soc., 1936, A, **156**, 561—570).—The extinction coeffs. of solutions of FeSO₄,

FeCl₂, Fe₂(SO₄)₃, and FeCl₃ have been measured to 2200 Å. On the irradiation of FeSO₄ solutions below 2900 Å., gaseous H₂ is evolved, with simultaneous formation of Fe⁺⁺⁺ (A., 1936, 11). This is attributed to a primary process Fe⁺⁺HOH + $h\nu$ → Fe⁺⁺⁺ + H + OH', followed by H + H → H₂, which competes with the reverse reaction Fe⁺⁺⁺ + H → Fe⁺⁺ + H'. L. L. B.

Ultra-violet absorption and rotatory dispersion of 3-methylcyclohexanone. H. S. FRENCH and M. NAPS (J. Amer. Chem. Soc., 1936, **58**, 2303—2305).—Data for solutions in cyclohexane give evidence for the non-homogeneous nature of the CO absorption band and for the induced dissymmetry of the CO group. E. S. H.

Ultra-violet absorption spectra of substituted diphenyls. L. W. PICKETT, G. F. WALTER, and H. FRANCE (J. Amer. Chem. Soc., 1936, **58**, 2296—2299).—Absorption curves showing mol. extinction coeffs. in the region 32—46,000 cm.⁻¹ have been determined for 5 Me and Cl derivatives of Ph₂ and for *o*-, *m*-, and *p*-C₆H₄Ph₂. The compounds with restricted rotation differ markedly in the intensity and structure of the absorption band from those capable of free rotation. E. S. H.

Ultra-violet spectrum of hæmoglobin and its derivatives. G. A. ADAMS (Biochem. J., 1936, **30**, 2016—2022; cf. A., 1936, 662, 1400).—Ultra-violet absorption curves are described for reduced hæmoglobin (I), oxy- (II), carboxy-, neutral and alkaline met-hæmoglobin, alkaline and acid hæmatin (III) in aq. and org. solvents, reduced alkaline (III), C₅H₅N- and piperidine-hæmochromogens, hæmatoporphyrin (IV), bilirubin (V) in ammoniacal and org. solvents, and also for native and denatured horse globin (VI). (II) and its derivatives have a main band in the region of 4000 Å., a small band at 3750 Å., and a broad shallow band at 3400 Å. The band at 2700 Å. is due to (VI) and is obtained with native and denatured (VI). (III) compounds in org. solvents show greater absorption, and the peak of the band is shifted towards the violet. (V) has a broad band extending from 5000 Å. to about 4100 Å., but there is no band at 3400 Å. The intense band at 4000 Å. in (I) compounds is not related to the valency of the Fe, since it is also given by Fe-free (IV). It occurs only when the porphyrin-pyrrole ring system is present. P. W. C.

Ultra-violet absorption spectra of coproporphyrin and of some of its metallic complexes. M. PAIC (Compt. rend., 1936, **203**, 933—935).—Data are given for coproporphyrin and complexes containing Fe and Cu, in the range 2400—4300 Å. A. J. E. W.

Cytochromes. III. Hæmatins of animal and vegetable origin.—See A., III, 9.

Absorption spectra of tyrosine, tryptophan, and their mixtures.—See A., 1936, 1528.

Infra-red absorption of hydrogen chloride in non-ionising solvents. D. WILLIAMS (Physical Rev., 1936, [ii], **50**, 719—722; cf. Plyler, A., 1936, 406).—The infra-red absorption of HCl in C₆H₆, PhCl, PhNO₂, and *m*-C₆H₄Me·NO₂ was measured. In

each case the fundamental vibrational frequency was lower than for the gas. Variation in frequency increased regularly with dipole moment of solvents of the same chemical nature. The displacement of the 3.4 μ band approached no limiting val. Results are attributed to the combined effects of dipole interaction and the formation of complexes.

N. M. B.

Infra-red absorption of hydrogen peroxide. A. MAIONE (Nuovo Cim., 1935, 12, 358—360; Chem. Zentr., 1936, i, 958).—The 1.5 and 2 μ bands of H_2O_2 are displaced to greater $\lambda\lambda$ in H_2O_2 . That at 4.6 μ is probably displaced to 4.85 μ and a new max. is observed at 4.4 μ .

H. J. E.

Infra-red absorption spectra of H_2S , HDS, and D_2S . C. R. BAILEY, J. W. THOMPSON, and J. B. HALE (J. Chem. Physics, 1936, 4, 625—631).—The spectra have been investigated to 15 μ using a monochromating prism spectrometer and results are correlated with Raman data. Fundamental frequencies have been assigned and frequencies corresponding with infinitesimal amplitude have been calc. The vertical angle is most probably 110° instead of 92° obtained from a rotational analysis.

W. R. A.

Behaviour of aqueous sulphate solutions in the infra-red spectrum. M. BATTISTA (Nuovo Cim., 1935, 12, 342—347; Chem. Zentr., 1936, i, 958).—The H_2O bands at 1.5 and 2.0 μ occur unchanged in aq. $CuSO_4$ and $FeSO_4$ and that at 3.0 μ is displaced to higher $\lambda\lambda$. In presence of $MnSO_4$ reduced absorption was observed at 1.3—1.5, 2.6—3.5, and at > 4.3 μ . The cation has a characteristic influence.

H. J. E.

Infra-red evidence for existence of hydrogen linkings. W. GORDY (J. Chem. Physics, 1936, 4, 749—750).—Changes in the infra-red spectrum caused by mixing liquids such as H_2O , alcohols, etc. with $COMe_2$, ethers, etc. have been observed and are attributed to changes in the electric moment of the H-carrying group due to formation of H linkings.

F. L. U.

Rotation-vibrations in the infra-red of molecules containing the hydrogen isotope of mass 2. II. C₂H₂D spectrum and the C—C and C—H separations in acetylene (additional data). G. HERZBERG, F. PATAT, and H. VERLEGER (Z. Physik, 1936, 102, 1—22; cf. A., 1935, 10).—The fine structure of new bands at 1.063, 0.815, and 0.784 μ has been measured. Ground state separations are: C—H 1.057 Å., C—C 1.204 Å. A vibrational analysis is given for C₂H₂.

A. B. D. C.

Absorption spectra of vapours of alcohols and of nitric acid in the region of the O—H harmonic band at λ 9500. R. M. BADGER and S. H. BAUER (J. Chem. Physics, 1936, 4, 711—715; cf. A., 1936, 1179).—Absorption spectra in the region λ 9450—9850 of Me, Et, Pr ^{α} , Pr ^{β} , Bu ^{α} , Bu ^{β} , sec.-Bu, Bu ^{γ} , and allyl alcohols, ($\cdot CH_2 \cdot OH$)₂, PhOH, o-C₆H₄Cl-OH, and HNO₃ have been measured. All show a strong harmonic band of the O—H vibration with systematic shifts of frequency corresponding with changes in structure. Pauling's suggestion of two configurations for o-C₆H₄Cl-OH is adopted.

F. L. U.

Effect of *ortho*-substitution on the absorption of the OH group of phenol in the infra-red. O. R. WULF, U. LIDDEL, and S. B. HENDRICKS (J. Amer. Chem. Soc., 1936, 58, 2287—2293).—Curves relating the mol. absorption coeff. of o-substituted phenols with position in the spectrum have been determined. The results are discussed in the light of Pauling's interpretation (cf. A., 1936, 718).

E. S. H.

Intermolecular forces and O—H absorption bands in [aliphatic] alcohols at 3 μ . J. ERRERA and P. MOLLET (Nature, 1936, 138, 882).—Evidence that the band at 3640 cm.⁻¹, which appears on dilution, and not that at 3350 cm.⁻¹ is the fundamental O—H band of the isolated mol. is advanced. The 3350 cm.⁻¹ band is strongly affected by intermol. forces.

L. S. T.

Absorption spectra of secondary amines in the near infra-red. M. FREYMANN (Compt. rend., 1936, 203, 721—722).—Data are given for 8 sec. amines in the range 0.8—1.2 μ . Variation of the λ of a strong band attributed to NH with the nature of the attached groups is discussed.

A. J. E. W.

Absorption spectra of benzene and its derivatives in the near infra-red (6000—9500 Å.). P. BARCHEWITZ (Compt. rend., 1936, 203, 930—933).—Data are given for C₆H₆ and 12 simple derivatives. The influence of substituents on the λ of bands due to CH is discussed.

A. J. E. W.

Raman spectra of sulphur and phosphorus. I. Polarisation and molecular structure. C. S. VENKATESWARAN (Proc. Indian Acad. Sci., 1936, 4, A, 345—354).—An intense Raman spectrum of liquid P gives 3 lines the polarisation of which indicates a tetrahedral mol. The S mol. is considered to be a symmetrical puckered ring made up of two squares of four atoms each, one square at 45° to the other. Strong infra-red absorption is explained if the neighbouring atoms in the plane of each square are connected with co-ordination linkings giving rise to electric dipoles. $\lambda\lambda$ 470, 216, 150, and 434 are assigned to vibrations in the model. The changes of S on heating are explained. A method of distilling substances of high b.p. is described.

N. M. B.

Raman spectra of sulphur and phosphorus. II. Lattice oscillations. C. S. VENKATESWARAN (Proc. Indian Acad. Sci., 1936, 4, A, 414—418).—Theories regarding the origin of the discrete Raman lines for solids in place of the winged Rayleigh line in liquids are discussed. The 88 cm.⁻¹ Raman line of rhombic S appears as a weak diffuse line in liquid S at 80 cm.⁻¹, and is attributed to lattice vibrations. The intense sharp 36 cm.⁻¹ Raman line of solid P broadens to a depolarised wing for liquid P. This frequency agrees with the frequency of vibration of the crystal lattice calc. from the m.p. Objections to assigning these lines to Pauling rotation or to intramol. oscillations of polymerised groups are indicated.

J. W. S.

Raman effect and molecular structure of nitric anhydride. J. CHEDIN and J. C. PRADIER (Compt. rend., 1936, 203, 722—724).—N₂O₅ gives two distinct Raman spectra; that of the gas and solutions in POCl₃, CHCl₃, and CCl₄ is attributed to single mols.,

and that of the solid and HNO_3 and H_2SO_4 solutions to a polymerised form. A. J. E. W.

Raman spectra of boron trifluoride, trichloride, and tribromide. Effect of boron isotopes. T. F. ANDERSON, E. N. LASSETTRE, and D. M. YOST (J. Chem. Physics, 1936, 4, 703—707; cf. A., 1934, 1289).—Raman spectra of BF_3 , BCl_3 , and BBr_3 are recorded. Using force consts. determined from vibrational data, the frequencies ν_3 and ν_4 to be expected for compounds containing ^{10}B have been calc., and these agree with the observed vals. obtained from doubling of the ν_3 lines. Calc. inter-nuclear distances agree with those determined by electron diffraction experiments. F. L. U.

Raman spectra of linear triatomic molecules of the type XYZ. Vibration spectrum and constitution of the selenocyanide ion. P. SPACU (Bull. Soc. chim., 1936, [v], 3, 2074—2076).—Raman frequencies for aq. KCNSe have been determined. The results indicate that the formula of the anion is $\text{N}\cdot\text{C}\cdot\text{Se}^-$, and comparison with $\text{N}\cdot\text{C}\cdot\text{Br}$ shows the arrangement to be linear. F. L. U.

Constitution of phosphorous acid and the phosphites. R. ANANTHAKRISHNAN (Nature, 1936, 138, 803).—An improved device (cf. A., 1936, 1480) for obtaining Raman spectra of cryst. powders reveals additional Raman frequencies in the spectrum of C_{10}H_8 and the $\text{N}\cdot\text{H}$ bands in the solids of the NH_4 group. Sharp, intense lines with frequency shifts 2486 and 2509 cm^{-1} indicate that H_3PO_3 is $\text{O}\cdot\text{PH}(\text{OH})_2$. L. S. T.

Raman effect in absolute perchloric acid. R. FONTEYNE (Nature, 1936, 138, 886—887).— HClO_4 solutions up to 70% (2.4 mols. of H_2O) produce the same Raman lines, 450, 620, 922, 1110 cm^{-1} , as saturated solutions of LiClO_4 and NaClO_4 , and hence the nature of the radical corresponding with these lines, the ClO_4' ion, is identical. As $[\text{HClO}_4]$ increases these lines are gradually replaced by 570, 730, 1026, and 1190 cm^{-1} , which have the same aspect and relative intensity as the corresponding lines of ClO_4' . The structure of the HClO_4 mol. must therefore be similar to that of the ClO_4' ion, and when both acid and H_2O are present $(\text{HOClO}_3)_2$, HOClO_3 , and ClO_4' exist side by side. L. S. T.

Raman spectrum of N-deuteropyrrole. G. B. BONINO and R. MANZONI-ANSIDEI (Ricerca Scient., 1936, [ii], 7, Reprint, 2 pp.).—The prep. of $\text{C}_4\text{H}_5\text{ND}$ is described: d_4^s 0.9725; 1.5017; n_D^{25} 1.5056. Raman lines are recorded. The frequency characteristic of ND is 2536 cm^{-1} , whereas in $\text{C}_4\text{H}_5\text{N}$ the NH frequency is 3390 cm^{-1} . O. J. W.

Raman effect and chemical constitution of pyrrole. G. B. BONINO and R. MANZONI-ANSIDEI (Ricerca Scient., 1936, [ii], 7, Reprint, 2 pp.).—Raman measurements with long exposures have been made using samples of $\text{C}_4\text{H}_5\text{N}$ prepared synthetically and from natural sources. The appearance of certain weak lines in the latter sample is discussed. O. J. W.

Raman spectrum of alkyl-dihydro- and -tetrahydro-pyridines. G. B. BONINO, R. MANZONI-ANSIDEI, and G. LEMETRE (Ricerca Scient., 1936,

[ii], 7, Reprint, 2 pp.).—Raman lines for two dihydro- and one tetrahydro-derivative of alkyl-substituted $\text{C}_5\text{H}_5\text{N}$ are recorded. These substances all contain the line characteristic of C:C in its normal position at about 1660 cm^{-1} . There does not therefore appear to be any strong conjugation between the C:C linking and the N. O. J. W.

Raman spectrum and molecular constitution of thiophen and furan. G. B. BONINO and R. MANZONI-ANSIDEI (Ricerca Scient., 1936, [ii], 7, Reprint, 2 pp.).—Raman measurements for these two substances are recorded. O. J. W.

Molecular symmetry of thiophen. G. B. BONINO (Ricerca Scient., 1936, [ii], 7, Reprint, 3 pp.).—Theoretical. The theory of groups has been applied to the consideration of mol. oscillations in certain possible structural formulæ of $\text{C}_4\text{H}_4\text{S}$. O. J. W.

Raman spectrum of anthracene, phenanthrene, and 9:10-dihydroanthracene. R. MANZONI-ANSIDEI (Ricerca Scient., 1936, [ii], 7, Reprint, 2 pp.).—Raman lines are recorded. The line 1631 cm^{-1} found for anthracene is probably due to a C:C linking between the C_{10} and C_{10a} , since it disappears with 9:10-dihydroanthracene. O. J. W.

Raman spectrum of d- α -pinene and of l- α -pinene. G. B. BONINO and R. MANZONI-ANSIDEI (Mem. Accad. Sci. Ist. Bologna, 1934—1935, [ix], 2, Reprint, 7 pp.).—The spectra of the two substances are identical. Some new lines have been found and previously recorded lines resolved into groups of lines. O. J. W.

Raman effect and organic chemistry: structure of the "oses." J. WIEMANN (Compt. rend., 1936, 203, 789—791).—Data are recorded for d-sorbitol, xylose, glucose, sorbose, arabinose, galactose, fructose, rhamnose, and mannose. None of these sugars has a frequency of about 1700 cm^{-1} . This shows the absence of the C:O group. The origin of various frequencies is discussed. H. J. E.

Optical investigation of some Indian oils. II. Raman effect. C. V. JOGARAO (Proc. Indian Acad. Sci., 1936, 4, 459—462).—The Raman lines of groundnut, coconut, gingelli, and ghee oils have been measured. All show the aliphatic C-H frequency at about 2900 cm^{-1} , whilst the last three show frequencies at about 1450 cm^{-1} which are ascribed to transverse vibration of the same group. All show the 1300 cm^{-1} frequency which is ascribed to the C:O:C group. A 1660 cm^{-1} frequency for gingelli oil confirms the presence of a double linking (in the triolein), whilst the absence of it in the other oils confirms that they are principally glycerides of saturated acids. J. W. S.

Ultra-violet luminescence of sodium chloride. M. SCHEIN and M. L. KATZ (Nature, 1936, 138, 883).—Curves showing the ultra-violet phosphorescence of normal and deformed crystals of NaCl after exposure to X-rays and then irradiated by visible light are reproduced. Normal crystals emit light of λ 2350 Å., and plastically deformed crystals emit, in addition, λ 2950 Å., but of shorter duration. L. S. T.

Fluorescence of salts surface-activated by condensed metals. A. TERENIN and F. CLEMENT (*Acta Physicochim. U.R.S.S.*, 1934, 1, 941—960).—A bright visible fluorescence is obtained from alkali halides in ultra-violet light after Ca, Tl, Pb, Bi, or Cd is condensed in vac. on them. The emission consists of broad bands and is excited by $\lambda < 3000$ Å. No fluorescence was observed with Na on alkali halides, or when the latter are replaced by AgCl, AgI, or Cu_2Cl_2 . The most intense effects were with NaBr, Tl (blue), NaI, Ca, Tl, Pb, or Bi (all violet), CsI, Ca, or Tl (yellow), and Pb (green).

CH. ABS. (e)

Phosphorescent glass. Influence of crystallisation. M. CURIE (*Compt. rend.*, 1936, 203, 996—997).—The cryst. form of $2\text{B}_2\text{O}_3 \cdot 3\text{ZnO}$ is strongly phosphorescent; the vitreous form is not. The difference is probably due to interionic forces in the crystal lattice.

A. J. E. W.

Fluorescence of pure substances. E. CANALS and P. PEYROT (*Compt. rend.*, 1936, 203, 998—999).—Pure specimens of 9 hydrocarbons were not fluorescent. Among other compounds examined, only those containing O showed fluorescence.

A. J. E. W.

Emitted fluorescence and the coefficient of absorption of dye solutions in the region of small concentrations. B. J. SVESCHNIKOV (*J. Phys. Chem. U.S.S.R.*, 1934, 5, 38—45).—Data are given for fluorescein, erythrosin, eosin-S, rhodulined, and rhodamine-B at concns. from 2×10^{-4} to 5×10^{-9} mols. per litre and for λ 3600—5460 Å. The formula derived from the theory of collisions of the second kind requires correction for spheres of action. With this correction the fluorescence yield is almost const.

CH. ABS. (e)

Detection of mitogenetic rays with the help of a physical differential method. Biological detection.—See A., 1936, 1548.

Thermo-electric processes in cuprous oxide. B. M. HOCHBERG and O. G. KVASCHA (*J. Exp. Theor. Phys. U.S.S.R.*, 1935, 5, 46—53).—The e.m.f. of Cu— Cu_2O thermocouples with varying O contents in the oxide was approx. const. (0.49—0.95 mv. per degree). The conductivity was $\propto 1/T$ (—150° to 500°). The e.m.f. fell above 750°. CH. ABS. (e)

Photographic elementary process in ionic crystals. L. M. SCHAMOVSKI (*Compt. rend. Acad. Sci. U.R.S.S.*, 1936, 4, 57—61).—Theoretical. The position of the first absorption max. of the alkali halides is calc. on the assumption that the elementary process is a direct transfer of an electron from the negative to the positive ion.

O. D. S.

Mechanism of electric breakdown in liquid dielectrics. L. D. INGE and A. F. VALTER (*Tech. Phys. U.S.S.R.*, 1934, 1, 539—550; *J. Tech. Phys. U.S.S.R.*, 1934, 4, 1669—1687).—Measurements were made on outgassed PhMe, xylene, transformer oil, tri-tolyl phosphate, and C_7H_{16} . Breakdown is due to direct extraction of electrons from the mols. of the liquid or from the electrodes, and not to thermal effects or ionisation by collision.

CH. ABS. (e)

Influence of anharmonic thermal oscillations of atoms on the electric resistance of metals. A. A. SMIRNOV (*J. Exp. Theor. Phys. U.S.S.R.*, 1934, 4, 229—234).—Theoretical. CH. ABS. (e)

Electrical conductivity of homopolar substances. II. A. P. ALEXANDROV and A. M. ZOLOTAREVA (*J. Exp. Theor. Phys. U.S.S.R.*, 1934, 4, 599—601).—The electrical conductivity of polymerised glassy styrene sheets at 35° was 2.5×10^{-19} mho for fields up to 20,000 volts per cm. The temp. dependence is given by $\gamma = Ae^{-27,000/T}$. The loss in wt. after passing the current was 10^9 times that calc. on Faraday's law. The conduction is ascribed to electrophoresis and electrocapillary processes.

CH. ABS. (e)

Behaviour of an anisotropic liquid in steady and alternating electric fields. V. FREDERICKSZ and G. MICHAÏLOV (*Acta Physicochim. U.R.S.S.*, 1936, 5, 451—463).—Data for the conductivity and dielectric losses of *p*-azoxyanisole between 134° and 145° do not indicate differences between the iso- and anisotropic states.

C. R. H.

Alternating-current investigation of anodically oxidised aluminium. W. BAUMANN (*Z. Physik*, 1936, 102, 59—66).—Dielectric const. and loss were measured at various voltages, frequencies, temp., and moisture contents for layers of Al_2O_3 obtained in $\text{H}_2\text{C}_2\text{O}_4$ and succinic acid baths.

A. B. D. C.

Dielectric losses in crystals. N. P. BOGORODITSKI and V. N. MALISCHEV (*J. Tech. Phys. U.S.S.R.*, 1934, 4, 1306—1317).—Dielectric losses in NaCl, muscovite mica, quartz, fused quartz, gypsum, and talc were measured. They are negligibly small over a wide temp. range, and are due to the movement of ions in the electric field.

CH. ABS. (e)

Collision ionisation in solid dielectrics. A. P. ALEXANDROV and A. M. ZOLOTAREVA (*Tech. Phys. U.S.S.R.*, 1934, 1, 142—150).—The non-dependence of the current on the dielectric layer thickness at voltages near the discharge voltage, and the local increase of conduction, point to the existence of weak spots in the dielectric.

CH. ABS. (e)

Permanent polarisation of electrets. G. GROETZINGER and H. KRETCH (*Z. Physik*, 1936, 103, 337—349).—The polarisation of electrets at and below the m.p. is studied by means of the discharge current from a condenser containing the electret as dielectric. The influence of temp. and high-frequency currents is examined and the conclusion reached that at any one temp. in the electret dipoles of differing mobility exist.

L. G. G.

Evaluation of molecular dipole moments from data of electrical Stern-Gerlach experiments. R. G. J. FRASER and J. V. HUGHES (*J. Chem. Physics*, 1936, 4, 730—731).—Recalculation of the results obtained by Rodebush and others (A., 1936, 924) for dipole moments of KCl and KI still reveals a considerable difference between their vals. and those of Scheffers (A., 1934, 717).

F. L. U.

Electrical conductance and dielectric constant of liquid hydrogen chloride. G. GLOCKLER and R. E. PECK (*J. Chem. Physics*, 1936, 4, 658—660).—

A special all-glass conductivity cell capable of withstanding pressures up to 30 atm. was constructed. The sp. electrical conductivity at -85° is given; the val. is $<$ found previously, and for fresh liquid HCl is $<$ for HCl which has been kept for some time. The temp. coeff. is negative. The mol. conductivity, ionisation const., and change of heat content of the ionisation reaction are determined. W. R. A.

Variation in dielectric constant of silver bromide on illumination. J. MARTENS (Z. Physik, 1936, 103, 217—236).—The variation in ϵ of thin layers of previously unexposed AgBr, during illumination with light of various frequencies, is studied. Microscopical counts of the particles released by the illumination agree with the nos. calc. from the observed increase in ϵ . A quantum efficiency of 18% is obtained. L. G. G.

Dielectric constant, conductance, and piezo-effect of Rochelle salt. H. KORNER (Z. Physik, 1936, 103, 170—190).—Vals. of ϵ for Rochelle salt measured by a static and a ballistic method are in good agreement. The "false pyro-effect" is shown to be a consequence of the piezo-effect. Measurement of the 18 possible piezo-electric moduli shows, in agreement with the Neumann-Voigt theory, that only 3 exist. L. G. G.

Dielectric constants of gases and vapours. VI. M. KUBO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1936, 30, 169—179; cf. A., 1936, 1182).—The dielectric const. of the vapours of $\text{CH}_2(\text{OEt})_2$ (I), $\text{CHMe}(\text{OEt})_2$ (II), and $\text{CO}(\text{OEt})_2$ (III), the mols. of which have two axes of free rotation, were measured at 328—477° abs. and used to calculate the dipole moments. Those of (I) and (II) increase with rise of temp., whilst that of (III) is 1.06D and is independent of temp. The vals. of the dipole moments are in the order (I) $>$ (II) $>$ $\text{CH}_2(\text{OMe})_2$, and this is explained in terms of intramol. forces, the mols. executing rotational oscillations around the two axes of free rotation. It is improbable that the constituents of the mol. of (III) lie in one plane. J. G. A. G.

Dipole moment and structure of organic compounds. XVI. **Electric moments of chlorinated diphenyls.** G. C. HAMPSON and A. WEISSBERGER (J. Amer. Chem. Soc., 1936, 58, 2111—2117; cf. A., 1936, 550).—Data are recorded for 2-, 3-, and 4-chloro-, and 2:2'- and 3:3'-dichloro-diphenyl. The results are discussed in relation to configuration. E. S. H.

Electric saturation in pure liquids and their mixtures. A. PIEKARA and B. PIEKARA (Compt. rend., 1936, 203, 852—854).—An electric field of 70,000 volts per cm. has no effect on the dielectric const. (ϵ) of C_6H_6 at -21° . Addition of PhNO_2 to C_6H_6 causes the application of the field to decrease ϵ , the effect being a max. for mixtures containing about 75% of PhNO_2 . At higher $[\text{PhNO}_2]$ the effect decreases, and an increase of ϵ due to the field is observed with $> 90\%$ PhNO_2 . It is concluded that there are two superimposed effects due to the field, one, electric saturation, causing diminution of ϵ , whilst the other, probably mol. deformation, increases ϵ . The presence of traces of H_2O causes PhNO_2 to show a decrease in

ϵ on application of the field (cf. Malsch, A., 1929, 13; 1930, 135). J. W. S.

Precision method for the determination of the molecular polarisation of non-dissociating liquids. G. ROSSELER (Z. Physik, 1936, 103, 191—216).—A crit. discussion on discrepancies in vals. of μ for any given compound by various authors. A new apparatus and technique are described for giving consistent data and exemplified by results for COMe_2 and COEt_2 . L. G. G.

Dipole moment and chemical structure. M. PUCHALIK (Acta phys. polon., 1935, 4, 145—150; Chem. Zentr., 1936, i, 983—984).—*cyclopentene* and *cyclohexene* have moments of 0.97 and 0.75 and of 0.92 and 0.63×10^{-18} e.s.u. in C_6H_{12} and in CCl_4 , respectively. The significance of these and earlier results is discussed in relation to the disposition of double linkings in aromatic structures. H. N. R.

Dielectric behaviour of camphor. W. A. YAGER (Bell Labs. Record, 1935, 14, 22—25).—Changes of sp. heat and d accompanying the large change of dielectric const. of camphor at its crit. temp. indicate that rotation of the mol., or of a part of it, is the cause of the high dielectric const. of cryst. camphor at room temp. CH. ABS. (e)

Two types of dielectric polarisation. A. H. WHITE (Bell Labs. Record, 1935, 14, 7—12).—The max. dielectric loss factor in a polar substance increases, whilst the max. in a heterogeneous mixture decreases, with fall of temp. CH. ABS. (e)

Relation between the absorption spectrum of electromagnetic waves and the adsorbed water content. Absorption spectrum of electromagnetic waves in wood fibre. M. SHIKATA and H. FUKUWATARI (J. Electrochem. Assoc. Japan, 1935, 3, 212—218).—The relationship between the absorption of waves from 20 to 6000 cycles and H_2O content of wood flour suspended in C_6H_6 was studied. 7.5—9% of H_2O gives an anomalous increase in dielectric const. The absorption val. at 6005 cycles \propto the H_2O content. The relaxation time calc. (10^{-5} — 10^{-6} sec.) for H_2O mols. distributed in the fibrous material corresponds with that of H_2O mols. in the space lattice of ice crystals at about -5° . CH. ABS. (e)

Stoichiometry. II. **Variation in volume of organic substances on fusion.** D. ROZENTAL (Bull. Soc. chim. Belg., 1936, 45, 585—623; cf. A., 1935, 1436).— d has been determined for C_6H_6 , α - and β -dotriacontane, *cyclohexane*, *dibenzyl*, *cyclohexanol*, PhNO_2 , p - $\text{C}_6\text{H}_4\text{Cl}_2$, p -xylene, *m*-cresol, *veratrol*, EtCO_2H , PrCO_2H , BuCO_2H , $\text{C}_5\text{H}_{11}\text{CO}_2\text{H}$, $\text{C}_6\text{H}_{13}\text{CO}_2\text{H}$, H_2O , and D_2O in the solid state, and the change in vol. on fusion (Δv) has been calc. Results do not agree with the Clapeyron-Clausius equation unless variables are considered at the same pressure. Δv alternates over the paraffin acids. In aromatic series NO_2 and OH diminish Δv , dT/dp , and the latent heat of fusion (L), and raise the temp. of fusion (T); the introduction of NH_2 causes all the variables to decrease, whereas the replacement of OH by NH_2 in AcOH lowers Δv and dT/dp , but increases T and L . Halogen substitution decreases Δv , and the replacement of Br by NO_2 increases Δv , T , and L .

L has been determined for *m*-cresol, Et palmitate, and Et stearate by observing the depression in f.p. in COPh_2 , anisole, and azobenzene, with the respective vals. 20.7, 79.3, and 34.1 g.-cal. per g. R. S. B.

Refractivity intercept and the specific refraction equation of Newton. I. Development of the refractivity intercept and comparison with specific refraction equations. S. S. KURTZ, jun., and A. L. WARD (J. Franklin Inst., 1936, 222, 563—592).—The equations of Lorenz and Lorentz, Gladstone and Dale, and Eykman for mol. refractivity are examined with respect to the experimental data for the C_7H_{16} isomerides. It is shown that one and the same sp. refraction equation cannot represent the effects both of variation of temp. and of constitution on *n* and *d*. The empirical relationship, $b - n = d/2$, where *b* is const., is termed the "refractivity intercept." This equation holds satisfactorily for a no. of series of hydrocarbons, *b* being const. in each homologous series. The refractivity intercept is of use in the selection of data concerning the properties of pure hydrocarbons, and in confirming the structure of a new hydrocarbon, and establishing its purity. The val. of *b* for org. compounds other than hydrocarbons is usually < 1, whilst for most hydrocarbons it is > 1.01, so that it may be used in the qual. analysis of org. compounds. It is also of val. in the quant. analysis of mixtures of hydrocarbons. A. J. M.

Optical antipodes and velocities of crystallisation. G. RUMEAU (Compt. rend., 1936, 203, 871—872; cf. A., 1933, 345).—The velocity of crystallisation (*v*) of *d*- Me_2 tartrate is equally affected by *d*- and *l*-malic acids, and *v* for *d*- Et_2 diacetyl-tartrate and for *d*-camphor α -methylsulphonate are equally affected by *d*- and *l*- Me_2 tartrates. It is concluded that *v* has no connexion with the optical activity of the substance. J. W. S.

Circular dichroism of solutions of camphor in organic solvents. G. BRUHAT and P. GUÉNARD (Compt. rend., 1936, 203, 784—786).—Dil. solutions of camphor in CCl_4 , C_6H_{14} , cyclohexane, and C_6H_6 have the same curve of circular dichroism. The dextrorotatory dispersion curve in the ketonic absorption region is the same for the four solvents. Superposed on this is an *l*-rotation, associated with other absorption bands, which varies with the solvent. In EtOH the curves are displaced by 50 Å. towards smaller $\lambda\lambda$. H. J. E.

Circular dichroism of solutions of camphor in water and in acids. G. BRUHAT and P. GUÉNARD (Compt. rend., 1936, 203, 862—864; cf. preceding abstract).—The sp. circular dichroism of camphor in aq. solution attains the same max. val. (3600° per dm.) as for solutions in org. solvents, but occurs at slightly shorter λ (2900 Å.) and the band is narrower. $[\alpha]_D$ calc. is 65° instead of 97° for org. solvents. Addition of HCl or H_2SO_4 increases the absorption for short $\lambda\lambda$, but does not affect the circular dichroism, whereas the rotatory dispersion is greatly modified (cf. Lecompte and Perrichet, Rev. d'Optique, 1935, 14, 399). J. W. S.

Electrical birefringence of liquid nitrogen and oxygen. R. GUILLIEN (Physica, 1936, 3, 895—903;

cf. A., 1935, 917).—Data are recorded for pure N_2 and O_2 . Vals. of Kerr's const. calc. from depolarisation of light scattered by the gases are > measured vals. The temp. variation is not in agreement with theory. O. D. S.

Rotatory magnetic polarisation and magnetic birefringence of acetone and nitrobenzene solutions of 1-nitronaphthalene. J. RABINOVITCH (Compt. rend., 1936, 203, 718—720).—The magnetic rotatory power for the solutions follows the additive law. The magnetic birefringence shows abnormalities for COMe, solutions, probably due to association.

A. J. E. W.

Magneto-optical dispersion of organic liquids in the ultra-violet. IX. Formic acid, methyl formate, and isopropyl formate. B. P. M. WALTERS and E. J. EVANS (Phil. Mag., 1936, [vii], 22, 816—832; cf. A., 1931, 24).—Data including *n* are recorded and represented by equations. Vals. of the Verdet const. are calc. H. J. E.

Influence of various substituents, and their position, on the Kerr effect. I. Purification of nitrobenzene. Influence of electrode materials on conductivity etc. II. Effect of positive and negative groups in the *p*-position on the magnitude of the Kerr effect. III. Frequency dependence of ϵ of nitrobenzene, and discussion of the theory of the Kerr effect. O. HILKE (Z. Physik, 1936, 103, 350—367, 368—386, 387—394).—I. A detailed description of the measurement of the Kerr effect on liquids is given. The conductivity of PhNO_2 is shown to be dependent on method of purification, condenser plate material, and humidity, and to influence the field distribution in the Kerr cell. A method of purification is described giving PhNO_2 of low conductivity with resultant uniformity of field in the cell. *B* for PhNO_2 is 3.94×10^{-5} .

II. *B* for a large no. of aromatic compounds in PhNO_2 solution has been measured, and from the results it is established that positive groups in the *p*-position to a "Kerr group" (e.g., NO_2 , CHO) increase *B*, whilst negative groups similarly situated decrease it. This effect is compared with the effect of similar groups on velocity of hydrolysis. The non-linearity between *B* and concn. in these solutions is explained and various other "Kerr groups" are noted which when substituted for NO_2 yield higher vals. of *B*.

III. ϵ for PhNO_2 has been measured over a range of frequencies; it varies between $\nu = 3.5 \times 10^6$ and $\nu = 1.27 \times 10^7$, but is const. above and below these frequencies. The dependence of *B* on T^4 and E^4 (*E* = field strength) is discussed critically in the light of the theory of the Kerr effect. L. G. G.

Electrical Kerr effect in nitro-compounds. C. ZAKRZEWSKI (Acta Phys. Polon., 1934, 3, 291—295).—Measurements with a series of aromatic NO_2 -compounds in C_6H_6 solution at 19° are recorded. The NO_2 group causes a high Kerr const.

CH. ABS. (*e*)

Magneto-optical Kerr effect. C. ZAPF (Ann. Physik, 1936, [v], 27, 477—506).—The magneto-optical Kerr effect was investigated by observing the Kerr rotation of mirrors cut from natural magnetite crystals. The Kerr const. is dependent on the

crystallographic orientation of the reflecting faces, the difference for the 100 and 111 faces being about 20%. This is unexpected, since magnetite crystallises in the regular system. The Kerr effect was also investigated with Fe crystallites in the surface of a sheet of the metal. Magneto-optical and magnetic investigation of Fe and Ni sheets and rods under mechanical strain show that compression and extension have little effect on the Kerr rotation. Observations of the induction of strained Fe and Ni agree with previous results.

A. J. M.

Chemical linking. II. Absorption spectra of some dipole association products. R. F. HUNTER, A. M. QUREISHY, and R. SAMUEL (J.C.S., 1936, 1576—1580).—Ultra-violet absorption curves of the supposed addition complexes of four sets of pairs of org. substances are simple superpositions of the curves of the two components. This result, the position of max., and absorption data indicate that there is no real chemical linking between mols., and that the individuality of constituent mols. is preserved in the associations.

N. M. B.

History of the classical conception of valency. J. VAN ALPHEN (Chem. Weekblad, 1936, 33, 694—698).—A review of the development of the idea of valency from 1803 to 1860.

S. C.

Maximum valency of elements and atomic structure. VIII. Maximum valencies of elements in compounds and the m.p. of simple substances. B. ORMONT (Acta Physicochim. U.R.S.S., 1936, 5, 405—416).—Continuing previous work (cf. A., 1936, 1448) the relationship between the m.p. of metallic chlorides and fluorides and valency has been studied.

C. R. H.

Aspects of molecular asymmetry. J. K. SENIOR (J. Org. Chem., 1936, 1, 254—264).—Theoretical. Determination of the asymmetry of a system, e.g., a mol., by means of optical rotation and dipole moments is discussed. A finite assembly of point charges is shown to have no dipole moment if the symmetry of the assembly includes at least one homopolar axis. Of symmetrical systems only those having symmetry C_n or C^∞ have zero dipole moment. Stereochemical problems may often be more fully elucidated by consideration of both dipole moment and optical activity than by that of either alone; the case of tetra-substituted cyclohexane derivatives is discussed in detail. For non-rigid systems, e.g., mols. in which free rotation is possible, dipole moments are determined by the states of lower symmetry, whereas optical rotation is governed by the state of highest symmetry (since deviations therefrom give rise to equal amounts of *d*- and *l*-forms).

R. S. C.

Geometrical constitution of silicochloroform. M. DE HEMPTINNE and J. WOUTERS (Nature, 1936, 138, 884).—Measurements of the polarisation of the Raman lines of SiHCl_3 indicate a pyramidal structure of SiCl_3 which is more regular than that of CCl_3 in CHCl_3 . Electron diffraction gives Si—Cl 2.05 Å. and Cl—Cl 3.39 Å., showing that SiCl_3 is a pyramid of height 0.65 Å. with the angle $\text{ClSiCl} = 113^\circ 30'$.

L. S. T.

Dipole measurements of isomeric plato-complexes. II. K. A. JENSEN (Z. anorg. Chem., 1936, 229, 225—251; cf. A., 1936, 12).—The action of phosphines, arsines, and stibines on plato-salts is discussed, and a series of compounds is described of the type: α - and β - $[\text{PtX}_2(\text{YR}_3)_2]$, (where $\text{X} = \text{Cl}, \text{Br}, \text{I}, \text{NO}_2, \text{NO}_3$, and 0.5SO_4 , and $\text{YR}_3 = \text{PEt}_3, \text{PPr}^a_3, \text{PBu}^a_3, \text{PPhEt}_2, \text{PH}_2\text{Ph}, \text{PPh}_3, \text{AsEt}_3, \text{AsPr}^a_3, \text{AsBu}^a_3, \text{AsPh}_3, \text{SbEt}_3, \text{SbPr}^a_3, \text{SbBu}^a_3, \text{SbPh}_3$). Dipole moments of twenty which are sol. in inert solvents are given. The dipole moments of the α -compounds are probably approx. zero, corresponding with a *trans*-planar configuration, whilst a *cis*-structure is ascribed to the β -compounds, which have large dipole moments. β - $[\text{PtCl}_2(\text{PR}_3)_2]$ (I) compounds are formed by *cis*-decomp. of the original tetrammine type. β -Compounds derived from *tert.* amines resemble (I), but those previously known, derived from primary and *sec.* amines, are formed by *trans*-decomp. α - $[\text{Pt}(\text{NO}_2)_2(\text{SR}_2)_2]$ compounds possess a symmetrical nitro-structure, whilst the β -compounds have large moments, similar to the β -nitrates. The large dipole moments of the *cis*-phosphines and -sulphides suggest that the Pt-S (or P) linking is strongly polarised.

R. S.

Constitution of some platinamines. K. A. JENSEN (Z. anorg. Chem., 1936, 229, 252—264).—Hantzsch and Rosenblatt's hypothesis (A., 1930, 440) that $[\text{Pt}(\text{NH}_3)_4\text{X}_2]$ compounds are diacido-compounds and that the Pt is 6-covalent, is incorrect. γ - $[\text{PtCl}_2(\text{NH}_3)_2]$ (cf. Drew *et al.*, A., 1932, 562) is β - $[\text{PtCl}_2(\text{NH}_3)_2]$ (I) contaminated with $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ and coloured polynuclear μ - NH_2 -compounds. Black $(\text{PtClNH}_2\text{NH}_3)_2$ is obtained by the action of 20% aq. NaOH on (I). Mol. conductivities are given for the series α - and β - $[\text{PtX}_2(\text{NH}_3)_2]$ ($\text{X} = \text{NO}_2, \text{I}, \text{NO}_3$, and 0.5SO_4) in aq. solution and for corresponding $\text{PEt}_3, \text{AsEt}_3$, and SbEt_3 compounds in EtOH. The conductivity is due to aquotisation, which occurs slowly in the α -series and very rapidly in the β -series. Aquotisation or alcoholisation is greater when $\text{X} = \text{NO}_3$ or 0.5SO_4 than when $\text{X} = \text{Cl}$ or NO_2 . It is inferred from the conductivity data that the complex platonitrites are nitro-compounds. "Wolfram's red salt" is diamagnetic and cannot therefore contain Pt^{III} .

R. S.

Stereochemistry of co-ordinative quadrivalent nickel. K. A. JENSEN (Z. anorg. Chem., 1936, 229, 265—281).—Compounds of the type $[\text{NiX}_2(\text{PR}_3)_2]$ ($\text{X} = \text{Cl}, \text{Br}, \text{I}$, and $\text{R} = \text{Et}, \text{Pr}^a, \text{Bu}^a$), prepared by treatment of NiX_2 in EtOH with PR_3 , and the unstable $[\text{NiI}_2(\text{AsEt}_3)_2]$ are described. Only one form could be obtained in each case. The compounds are readily sol. in org. solvents, are decomposed by H_2O , and have low m.p. It is inferred from dipole moment determinations (moment approx. zero) that the configuration is *trans*-planar, whilst the green $[\text{Ni}(\text{NO}_3)_2(\text{PET}_3)_2]$ (dipole moment 8.8×10^{-18} e.s.u.) is a *cis*-compound. The Cl and Br derivatives are coloured dark blue or dark green by the action of Cl_2, Br , or NO_2 , and the unstable compound $[\text{NiBr}_3(\text{PET}_3)_2]$ has been isolated. The thiosemicarbazide (Thi) compounds α - and β - $[\text{NiThi}_2]\text{SO}_4$ and the compounds $[\text{Ni}(\text{S-C}_2\text{H}_4\text{-NH}_2)_2]$, $[\text{Ni}(\text{S-C}_3\text{H}_6\text{-NH}_2)_2]$, $[\text{Pt}(\text{EtS-C}_2\text{H}_4\text{-NH}_2)_2][\text{PtCl}_4]$,

[PtCl₂(EtS·C₂H₄·NH₂)], [PdCl₂(EtS·C₂H₄·NH₂)], Ni(S·CH₂·CH·NH₂·CO₂)₂·2H₂O, and the Ni compound of 8-thiolquinoline are described. R. S.

Stereochemistry of co-ordinative quadri-valent cobalt. K. A. JENSEN (Z. anorg. Chem., 1936, 229, 282—284).—Complex PEt₃ derivatives of CuCl₂, FeCl₃, MnCl₃, and CrCl₃ could not be obtained, but the compounds [CoCl₂(PEt₃)₂](I) and [CoCl₂(PPr₃)₂] have been prepared. The dipole moment of (I) is 8.7×10^{-18} e.s.u., suggesting a *cis*-planar or a tetrahedral structure. R. S.

Constitution of complex metallic salts. V. Constitution of the phosphine and arsine derivatives of cuprous iodide. Configuration of co-ordinated cuprous complex. F. G. MANN, D. PURDIE, and A. F. WELLS (J.C.S., 1936, 1503—1513; cf. A., 1936, 1184, 1496).—Non-ionic monoiodotrialkyl-arsine-(or -phosphine)-copper [R₃As(P)→CuI], prepared by shaking the alkyl-phosphine or -arsine with an equimol. quantity of CuI in KI, resemble [R₃P(As)→AuCl]. They are insol. in H₂O, sol. in org. solvents, and contain 2-co-ordination Cu. The following are described. *Tetrakis(monoiodotriethylphosphine)copper* (I), m.p. 236—240° after softening at 230°, and the corresponding *Pr*^a, m.p. 206—207°, *Bu*^a (II), m.p. 75°, and *n*-*amyl*, m.p. 27°, compounds; the *trimethylarsine* analogue, decomp. > 300° without melting, and corresponding *Et* (III), decomp. 190—240°, *Pr*^a, m.p. 205—212°, *Bu*^a, m.p. 61°, and *n*-*amyl*, an oil, m.p. < 0°, compounds; the *Br*-analogue of (III), m.p. 234—235° (decomp.). (II) with 2:2'-dipyridyl gives *monoiodo-2:2'-dipyridyltri-n-butylphosphinecopper* (IV), m.p. 123°, which when boiled in EtOH or C₆H₆ gives PBu₃ and deep red *bisdipyridyl-μ-di-iodocopper*, m.p. 274—275° (decomp.) (also prepared directly but less pure). The orange *arsine* analogue of (IV) changes to deep red at 102—104°. 2:2'-Dipyridyl with HI (*d* 1.7) in aq. CuI gives red *crystals* (? dipyridyl cupro-iodide), m.p. 142—145° (decomp.). Cu₂I₂ in KI with 2 equivs. of Et₃As gave a white ppt., probably [(AsEt₃)₂CuI], m.p. about 55° with evolution of Et₃As and resolidifying as crude (III); with 1 equiv. of Et₂S a white ppt., m.p. 128—130° (decomp.) in sealed tube, was produced. (I) crystallises in dodecahedra; a complete X-ray analysis has been made and the crystallographic data are discussed. The 4 Cu are at the apices of a regular tetrahedron with AsEt₃ groups projecting on the lines from the centre. I are at the centre, but above the plane of each face. In simple units [AsR₃→CuI] is unstable, but in the tetrakis-mol. stability is enhanced, the co-ordination being 2 in the simple and 4 in the four-fold mol. Confirmatory evidence is obtained from a study of 2:2'-dipyridyl derivatives and from mol. wt. determinations. (II) has a dipole moment of 1.60 *D* in C₆H₆ at 25°, showing that the linkings from the Cu are set at an angle. Parachor determinations are given. W. R. A.

Electrostatic energy as the mutual energy of vibrating particles. E. T. JONES (Phil. Mag., 1936, [vii], 22, 921—938).—Theoretical.

A. J. E. W.

Electronic constitution of crystals; LiF and LiH. D. H. EWING and F. SEITZ (Physical Rev.,

1936, [ii], 50, 760—777).—Mathematical. Using approximation methods previously employed in metals, a self-consistent solution of the Hartree-Fock system of equations for the ionic crystals LiF and LiH is attempted. N. M. B.

Ionic deformation in binary crystals. T. NEUGEBAUER (Z. Krist., 1936, 94, 349—357).—Mathematical. The distortion of the electron-cloud of an ion in the non-homogeneous field of an external point charge is formulated, and the consequent development of dipole, quadrupole, etc. moments in lattices of various general types is demonstrated.

B. W. R.

Electronic energy bands in sodium chloride. W. SHOCKLEY (Physical Rev., 1936, [ii], 50, 754—759).—Mathematical. Wave functions in NaCl are calc. by the Wigner-Seitz method of cellular potentials (cf. A., 1933, 660). Energy contours in momentum space are drawn for the Cl 3*p* band. N. M. B.

Relative and absolute values of atomic levels. H. R. ROBINSON (Phil. Mag., 1936, [vii], 22, 854—855).—Polemical against Sandstrom (A., 1936, 1041).

H. J. E.

Relation between form, force constants, and vibration frequencies of triatomic systems. W. G. PENNEY and G. B. B. M. SUTHERLAND (Proc. Roy. Soc., 1936, A, 156, 654—678).—In general, the shape of a mol. can be roughly determined from the vibration frequencies. The linking force field equations are preferable to those of the central force field for determining the form and force consts. of symmetrical triat. mols. Present assignments of the fundamental vibration frequencies in O₃, NO₂, F₂O, and Cl₂O are criticised, and new assignments are suggested in O₃, F₂O, and Cl₂O. Badger's relation (A., 1934, 477) can be used only to determine inter-nuclear distances from force consts. L. L. B.

Assignment of the fundamental vibration frequencies in O₃, F₂O, Cl₂O, NO, and N₃⁻. G. B. B. M. SUTHERLAND and W. G. PENNEY (Proc. Roy. Soc., 1936, A, 156, 678—686).—The proposed assignments of the fundamental vibration frequencies in O₃, F₂O, and Cl₂O (cf. preceding abstract) interpret the experimental data as well as, if not better than, the earlier assignments. The interpretations of the vibration spectra of NO₂ and N₃⁻ are discussed. The N₃⁻ ion seems to have a different structure in aq. solution (where it is linear and symmetrical) and in the Pb azides. L. L. B.

Modern quantum mechanics and the benzene problem. III. G. ELSÉN (Chem. Weekblad, 1936, 33, 679—687).—A review of relevant information published since 1933 (cf. A., 1933, 664). S. C.

Energy of carbon atoms, and the reactivity of organic molecules. J. M. PAUSCHKIN (J. Gen. Chem. Russ., 1936, 6, 1133—1143).—Theoretical.

R. T.

Quartet states in diatomic molecules intermediate between cases *a* and *b*. W. H. BRANDT (Physical Rev., 1936, [ii], 50, 778—780).—Mathematical. The determinantal equation given by Hill and Van Vleck for the energies of diat. mols. inter-

mediate between Hund's cases *a* and *b* is set up for quartet states and solved by a series method.

N. M. B.

Effective cross-section in the recombination of atoms with radiation. V. N. KONDRATEEV (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 250—254).—Theoretical. The recombination probability is independent of the relative velocities of the atoms, provided the vibrational state of the resulting mol. is not considered.

CH. ABS. (e)

Effective cross-section in the recombination of atoms on irradiation. A. N. TEREININ and N. A. PRILESHAeva (J. Phys. Chem. U.S.S.R., 1934, 5, 1004—1012).—A theoretical expression is given for the rate of recombination. The recombination of atoms formed from a diat. mol. has a probability of the order of 10^{-4} — 10^{-8} . Data for Cl_2 , HBr , HI , TI , and NaI are discussed.

CH. ABS. (e)

"Optical" and "interference" total reflexion of X-rays. I. P. P. EWALD and E. SCHMID. II. E. SCHMID (Z. Krist., 1936, 94, 150—164, 165—196).—I. There are two kinds of total reflexion of X-rays at crystal surfaces, one an interference phenomenon occurring near the Bragg angle, the other analogous to optical total reflexion, occurring nearly at grazing incidence. The relationship between these is discussed, and the Fresnel equations for reflexion at a surface are examined from a new point of view.

II. A detailed mathematical treatment of the above is given.

B. W. R.

Matrix-algebraic development of the crystallographic groups. IV. F. SEITZ (Z. Krist., 1936, 94, 100—130).—Mathematical.

B. W. R.

Structure of liquids and solids. H. MÜLLER (Cold Spring Harbor Symp., 1934, 2, 1—5).—A review.

CH. ABS. (e)

Principles of crystal growth. G. L. CLARK (Cold Spring Harbour Symp., 1934, 2, 6—14).—A résumé.

CH. ABS. (e)

Crystallisation of copper. A. B. GREENINGER (Amer. Inst. Min. Met. Eng., Inst. Met. Div., 1935, Tech. Publ. 643, 12 pp.).—Orientation relationships between large neighbouring grains of Cu polycrystals slowly cooled from the melt were determined by back-reflexion Laue X-ray photographs.

CH. ABS. (e)

Centres of recrystallisation in deformed zinc monocrystals. V. D. KUZNETZOV and M. P. KARPOVA (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 202—208).—Tempering was carried out at 250—350°. Formation of new nuclei occurs on the boundary of the crystal twins, the time and temp. necessary for tempering for formation of nuclei being the smaller the wider were the twins. The first nuclei form where several twins intersect.

CH. ABS. (e)

Role of mechanical twin formation in the recrystallisation of deformed zinc single crystals. V. D. KUZNETZOV and V. A. ZOLOTOV (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 75—86).—Zn single crystals 3.5 mm. in diameter prepared by Bridgman's method were obtained in types with angles of 4° and 50° between the axis and the base. On strong bending the former gave twinning, the second did not. On

heating for 1 hr. at 400° the first type recryst. Twinning and nucleus formation take place in the uncompressed layers. Recrystallisation takes place only if twinning has occurred.

CH. ABS. (e)

Structure of aluminium, chromium, and copper films evaporated on glass. R. BEECHING (Phil. Mag., 1936, [vii], 22, 938—950).—Films of varying thickness deposited in a vac. have been investigated by electron diffraction. Thin films consist of the oxides of the metals in unusual crystal forms, in the case of Al related to $\gamma\text{-Al}_2\text{O}_3$. Thicker films also give diffraction patterns of the metal; in most cases these disappear on heating to 250°, the oxide patterns remaining. Thick Al and Cr films were pure metal on the surface. The O_2 is probably liberated from the glass surface by atom bombardment.

A. J. E. W.

X-Ray study of sulphuric and orthophosphoric acids. J. T. RANDALL (Nature, 1936, 138, 842).—The curve for the scattering of $\text{Mo K}\alpha$ radiation by H_3PO_4 , containing 1% of H_2O , is practically identical with that for H_2SO_4 , each having one main sharp diffraction band at an equiv. spacing of 3.85 Å.

L. S. T.

Artificial inorganic fibre. F. MACHATSCHKI (Naturwiss., 1936, 24, 742—743).—A colloidal alumino-vanadate was acidified and heated to 300° in a bomb-tube. Amongst the resulting yellow rhombohedral crystals were small bundles of fibres of V_2O_5 , shown by X-ray analysis to be identical with ordinary V_2O_5 . The threads consist of an endless chain of V_2O_5 mols., the units being strongly deformed VO_4 tetrahedra.

A. J. M.

X-Ray examination of aluminium boride, AlB_{12} . S. VON NARAY-SZABÓ (Z. Krist., 1936, 94, 367—374).—Commercial "cryst. B" contains, among other compounds, a diamond-like substance AlB_{12} , with a very low C content. The cell is tetragonal or rhombic pseudo-tetragonal, 16 mols. in cell, a_0 12.55, c_0 10.18 Å.

B. W. R.

Crystals of the realgar type: the symmetry, unit cell, and space-group of nitrogen sulphide. M. J. BUEGER (Amer. Min., 1936, 21, 575—583).—New X-ray results based on the equi-inclination Weissenberg method show N_4S_4 to be monoclinic, a 8.78, b 7.14, c 8.64(5) Å., β 87° 39', 16 NS per cell, $d_{\text{calc.}}$ 2.23(7); space-group $P2_1/n$. The general characteristics of the cell are identical with those of realgar (A., 1935, 323), but the dimensions are markedly different, owing to the difference in radii of the N and the As. Jaeger and Zanstra's proposed structure (A., 1932, 797) for NS is incorrect.

L. S. T.

Crystal structure of rubidium sulphide, Rb_2S . K. MAY (Z. Krist., 1936, 94, 412—413).—The cell is face-centred cubic, containing 4 mols.; space-group probably $Fm\bar{3}m$, a_0 7.65 Å.

B. W. R.

Crystal structure of ammonium azide, NH_4N_3 . L. K. FREVÉL (Z. Krist., 1936, 94, 197—211).—The cell is orthorhombic, with a_0 8.930, b_0 8.642, c_0 3.800 Å., 4 mols. in cell, space-group $Pman$. Detailed parameters are found from intensity measurements.

B. W. R.

Crystal structure of anhydrous sodium chromate, Na_2CrO_4 . J. J. MILLER (Z. Krist., 1936, 94, 131—136).—The lattice is orthorhombic, space-group $Pbnn$; 4 mols. in the cell; a_0 5.91, b_0 9.23, c_0 7.20 Å. At. parameters are determined from estimated intensities. B. W. R.

Crystal structure of Cu_2Sb and Fe_2As . M. ELANDER, G. HAGG, and A. WESTGREN (Arkiv Kemi, Min., Geol., 1936, 12, B, No. 1, 6 pp.).—The structures advanced previously (A., 1929, 1139) for Cu_2Sb and Fe_2As have been confirmed, and at. parameters determined. Each Sb in Cu_2Sb is surrounded by four Cu distant 2.70 Å., four Cu distant 2.83 Å., and one Cu at 2.62 Å. As in Fe_2As is surrounded by four Fe at 2.40 Å., four Fe at 2.60 Å., and one Fe at 2.41 Å. distance. The Cu—Sb and Fe—As distances are < those calc. from the normal at. radii. J. S. A.

Crystal structure of quartz and aluminium orthoarsenate. F. MACHATSCHKI (Z. Krist., 1936, 94, 222—230).—The at. co-ordinates of SiO_2 and of AlAsO_4 are determined within narrow limits. B. W. R.

Crystal structure of Cu_3VS_4 [sylvanite]. D. LUNDQVIST and A. WESTGREN (Svensk Kem. Tidskr., 1936, 48, 241—243).—The results obtained by Pauling and Hultgren (A., 1933, 215) are confirmed. F. L. U.

Crystal structure of gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. W. A. WOOSTER (Z. Krist., 1936, 94, 375—396).—A detailed analysis of the structure is made, using a recording ionisation spectrometer and calculating machine for the Fourier synthesis. Layers of Ca and SO_4 are separated by planes of H_2O mols. in a layer lattice; this structure explains qualitatively the cleavages, thermal expansion anisotropy, and optical behaviour with temp. rise. The previous results of Onorato are criticised. B. W. R.

Crystal structure of $3\text{CdSO}_4 \cdot 8\text{H}_2\text{O}$. H. LIPSON (Proc. Roy. Soc., 1936, A, 156, 462—470).—The unit cell contains 4 mols. and has a_0 9.44, b_0 11.87, c_0 16.49 Å., β $117^\circ 16'$; space-group $12/a$ (C_{2h}^2). The 38 parameters defining the structure are given. L. L. B.

Crystal structure of arsenic and antimony trihydrides. H. BRAEKKEN (Kong. Norske Vidensk. Selsk. Forhandl., 1935, 8, No. 10, 1 p.; Chem. Zentr., 1936, i, 961).— AsBr_3 is rhombic (a 10.15, b 12.07, c 4.31 Å.; space-group $V4$; 4 mols. in unit cell). The structure is built up of pyramidal AsBr_3 mols. SbBr_3 is similar. H. J. E.

Stereochemistry of quadricovalent atoms: tervalent gold. E. G. COX and K. C. WEBSTER (J.C.S., 1936, 1635—1637).—X-Ray examination shows that $\text{K}(\text{AuBr}_4) \cdot 2\text{H}_2\text{O}$ has a 9.51, b 11.93, c 8.46 Å., β $94^\circ 24'$, space-group $P2_1/n$ (C_{2h}), and 4 mols. per unit cell. Each Au lies on a centre of symmetry with 4 Br in a plane around it. N. M. B.

Crystal structure of alkali tungsten (iii) chlorides. C. BROSSET (Arkiv Kemi, Min., Geol., 1936, 12, A, No. 4, 8 pp.).—The salts $\text{R}_3\text{W}_2\text{Cl}_6$, where $\text{R} = \text{NH}_4$, Rb, Cs, and Tl, are hexagonal, space-group $7-16$, $7-24$, $7-35$, and $7-15$, c 16.17, 16.95, 17.06, and 18.33 Å., respectively. The $(\text{W}_2\text{Cl}_6)^{2-}$ anions

lie on trigonal axes, with the at. arrangement $\text{Cl}_3\text{WCl}_3\text{WCl}_3$, the central Cl_3 group having larger spacings than the outer. J. S. A.

Crystal structure of the cadmium and mercury diammino-dihalides. C. H. MACGILLAVRY and J. M. BLIJVOET (Z. Krist., 1936, 94, 231—245).—Cell data and probable structures are given for $\text{CuCl}_2(\text{H}_2\text{O})_2$, $\text{Cd}(\text{NH}_3)_2\text{Cl}_2$, $\text{Cd}(\text{NH}_3)_2\text{Br}_2$, $\text{Hg}(\text{NH}_3)_2\text{Cl}_2$, and $\text{Hg}(\text{NH}_3)_2\text{Br}_2$. B. W. R.

Crystal structure of potassium chloro-osmate, K_2OsCl_6 , and of potassium bromo-osmate, K_2OsBr_6 . J. D. McCULLOUGH (Z. Krist., 1936, 94, 143—149).—Both compounds have the $(\text{NH}_4)_2\text{PtCl}_6$ cubic structure, a_0 9.729 and 10.30 Å., respectively. The halogen parameters are accurately determined. B. W. R.

Structure of silver uranyl acetate. I. FANKUCHEN (Z. Krist., 1936, 94, 212—221).—The cell is tetragonal, a_0 12.98, c_0 28.10 Å., space-group $I4_1/a$. Positions of the U and Ag are found from a Fourier analysis of intensities, the lighter atoms being located from general considerations. B. W. R.

Crystal lattice and twins in leucite. J. WYART (Compt. rend., 1936, 203, 938—939).—Crystals of leucite consist of aggregates of tetragonal crystals oriented in three directions. The unit cell contains 16 mols. of KAlSi_2O_6 , and has a 12.95, c 13.65 Å.; space-group D_{4h}^{10} . A. J. E. W.

Optical and X-ray investigation of kaolinite, halloysite, and montmorillonite. C. W. CORRENS and M. MEHREL (Z. Krist., 1936, 94, 337—348).—The refractive index of halloysite and montmorillonite depends on the H_2O content, and of the latter also on the MgO content and on the presence of other mols. which may replace the H_2O . All these minerals with X-rays give the silicate type of structure; the chief differences in the X-ray photographs are discussed. B. W. R.

Intracrystalline swelling and base-exchange power of montmorillonite. U. HOFMANN and W. BILKE (Kolloid-Z., 1936, 77, 238—251).—X-Ray diagrams show that montmorillonite (I) undergoes intracryst. swelling depending on the amount of H_2O taken up by the layered lattice. (I) has an unusually high power of base exchange; the mode of linking of the exchangeable cation is discussed. E. S. H.

X-Ray and thermal examination of the glycerides. II. α -Monoglycerides. T. MALKIN and M. R. EL SHURBAGY (J.C.S., 1936, 1628—1634; cf. A., 1934, 720).—A series of 9 α -monoglycerides from caprin to stearin, investigated by cooling and heating curves and by X-rays, exist in α (vertical rotating chains) and β' and β (tilted rigid chains) modifications. The molten glyceride solidifies in the α form, stable over only a small temp. range, and passes through a semi-vitreous state into the β' and finally to the stable β form. The first transition is rapid, and the speed of the other two varies inversely as the length of the mol. The long X-ray spacings of the β' and β forms are identical and correspond with a double mol. with the glycerol heads together, tilted through an angle $\approx 59^\circ$. The corresponding spacings of the α form agree with a double mol. lying vertically across the

terminal planes. All three forms are distinguished by their side spacings. *Mono-un-*, *-tri-*, *-penta-*, and *-hexa-decoim* have been prepared. N. M. B.

Diamagnetic anisotropy of crystals in relation to their molecular structure. (Mrs.) K. LONSDALE and K. S. KRISHNAN (Proc. Roy. Soc., 1936, A, 156, 597—613).—The relationships between crystal and mol. diamagnetic susceptibilities and mol. orientations for the different crystal systems are summarised. Attention is directed to an error in the deductions from magnetic measurements (A., 1933, 340) which has led to a non-existent discrepancy in the results of magnetic and X-ray determinations of mol. orientations. L. L. B.

Crystallisation of under-cooled liquids. W. T. RICHARDS, E. C. KIRKPATRICK, and C. E. HUTZ (J. Amer. Chem. Soc., 1936, 58, 2243—2248).—Experiments with salol, COPh_2 , and C_6H_6 show that crystallisation occurs spontaneously by a heterogeneous mechanism even in absence of over-heatable nuclei. The rôle of adsorption in heterogeneous crystallisation is discussed. E. S. H.

X-Ray study of substituted diphenyls. L. W. PICKETT (J. Amer. Chem. Soc., 1936, 58, 2299—2303).—Crystallographic data are recorded for dimesityl, *l*- and *r*-3:3'-diaminodimesityl, hexachlorodiphenyl, 2:2'-diphenic acid, and quaterphenyl. The last has a 8.05, b 5.55, c 17.81 Å., β 95.8°. E. S. H.

Crystal structure of condensed-ring compounds. IV. Fluorene and fluorenone. J. IBALL (Z. Krist., 1936, 94, 397—409; cf. A., 1936, 1451).—Fluorene has an orthorhombic cell, space-group probably *Pna*, a_0 8.47, b_0 5.70, c_0 18.87 Å., 4 mols. in cell. Fluorenone has an orthorhombic cell, space-group *Pbca*, a_0 16.00, b_0 12.50, c 18.63 Å., 16 mols. in cell. Probable structures are determined, and are similar; the fluorene mol. is not planar, and this result agrees with the optical and magnetic properties. B. W. R.

X-Ray diffraction studies of built-up films. G. L. CLARK and P. W. LEPLA (J. Amer. Chem. Soc., 1936, 58, 2199—2201).—The structure and thickness of built-up films of stearic acid and stearates are those of the constituent present in excess. The d spacings agree closely with those of the cryst. substance. Laue's particle-size equation has been tested, using films of known thickness. E. S. H.

Structure of animal and plant cellulose.—See A., III, 7.

Crystal structure of polonium by electron diffraction. M. A. ROLLIER, S. B. HENDRICKS, and L. R. MAXWELL (J. Chem. Physics, 1936, 4, 648—652).—Photographs were obtained from 10^{-7} g. of Po previously volatilised in H_2 and condensed on a thin collodion film. The patterns were found to resemble Te in having a pseudo-hexagonal lattice. The true lattice is probably monoclinic. A structure, based on the space-group $\text{C}_2^2\text{—C}_2$, gives fair agreement between observed and calc. intensities of reflexion. W. R. A.

Electron diffraction analysis of organic films. S. PINSKER and L. TATARINOVA (Acta Physicochim.

U.R.S.S., 1936, 5, 381—390).—Electron diffraction of paraffin crystals has been studied. Assuming a rhombic lattice, the calc. crystal dimensions are a 7.46, b 4.97, c 2.5 Å., which are in good agreement with vals. calc. from X-ray data. C. R. H.

Piezo-electric properties of Rochelle salt. O. NORGORDEN (Physical Rev., 1936, [ii], 50, 782).—Data and conclusions previously reported (cf. A., 1936, 927) are revised and extended. N. M. B.

Electrostriction in highly compressed gases. J. JAUMANN and E. KINDER (Z. Physik, 1936, 103, 263—275).—Measurements were made with H_2 , A, CO_2 , N_2 , and CO by an improved alternating field method over the ranges 1—50 atm. and -8° to 36° . Deviations from the Clausius-Mosotti equation, observed for CO_2 and N_2 , can be explained by the formation of a small no. of double mols. under the influence of the electric field. H. C. G.

Negative result of an attempt to detect nuclear magnetic spins. C. J. GORTER (Physica, 1936, 3, 995—998).—By means of the method previously described (A., 1936, 929) an attempt was made to detect in LiF and Na K alum a magnetic absorption due to transitions between levels of hyperfine structure. Although the method was capable of detecting 1/100 of the theoretical effect, no effect is observed. O. D. S.

Magnetic properties of bismuth. I. Dependence of susceptibility on temperature and addition of other elements. II. The de Haas-van Alphen effect. D. SHOENBERG and M. Z. UDDIN (Proc. Roy. Soc., 1936, A, 156, 687—701, 701—720).—I. The temp. dependence of the principal susceptibilities of Bi single crystals, which has been measured from room temp. to 14° abs., is considerably changed by the addition of small quantities of other elements. The effect of alloying on the susceptibility at low temp. is discussed.

II. The complicated periodic character of the variation of the magnetisation of Bi with field at low temp. (de Haas and van Alphen, A., 1933, 14) becomes marked at 4° abs. For fields up to 10,000 gauss, the effect disappears at about 40° abs. The alloying of traces of other elements (Pb, Sn, Te, and Sb) has a pronounced effect on the field dependence. The electronic structure of Bi is discussed. L. L. B.

Magneto-caloric effect on the Honda-Okubo theory of ferromagnetism. K. HONDA and T. HIRONE (Z. Physik, 1936, 102, 132—137).—Data on the magneto-caloric effect fit Honda and Okubo's theory of ferromagnetism (cf. *ibid.*, 1932, 75, 352). A. B. D. C.

Fields acting inside ferromagnetic materials. A. CARRELLI (Nuovo Cim., 1935, 12, 337—341; Chem. Zentr., 1936, i, 967). H. J. E.

Spectral variation of anomalous optical constants of thin silver. H. MURMANN (Z. Physik, 1936, 101, 643—648).—Refraction and absorption coeffs. have been measured for various thicknesses of Ag films between $\lambda\lambda$ 1050 and 265 μ : they are consistent down to the thinnest films, and are totally different from those of Ag in bulk. A. B. D. C.

Optical constants of thin silver layers. F. GOOS (Z. Physik, 1936, 102, 702; cf. A., 1936, 769). A reply to criticism (cf. Murmann, preceding abstract).

O. D. S.

Selective reflexion of silver and zinc in polarised light and its relation to the selective photoelectric effect. F. HLÚČKA (Z. Physik, 1936, 103, 237—245).—Reflexion data given between 2380 and 3660 Å. are discussed in relation to earlier work.

A. E. M.

Reflectivity of evaporated silver films. H. W. EDWARDS and R. P. PETERSEN (Physical Rev., 1936, [ii], 50, 871).—Pure Ag films deposited on glass by evaporation in vac. showed appreciably higher reflexion coeffs. than those prepared by other methods. The influence of variables in the evaporation process was investigated. Data for white light and Na arc light, with and without various filters, are given and compared with corresponding vals. for Al films similarly prepared.

N. M. B.

Influence of the polished surface on the optical constants of copper as determined by the method of Drude. H. LOWERY, H. WILKINSON, and D. L. SMARE (Phil. Mag., 1936, [vii], 22, 769—790; cf. A., 1935, 1065).—Dispersion curves ($\lambda\lambda$ 6800—4358 Å.) were measured for Cu mirrors prepared by evaporation, by mechanical polishing, and electrolytically. The val. of μ decreases, and that of the absorption coeff. increases, on removing the mechanically polished surface electrolytically. Mechanical disturbance of the surface extends beyond the Beilby layer to a depth of 0.0013—0.0029 cm., or more. H. J. E.

Variation of electrical resistance and reflecting power of metallic mirrors condensed at low temperatures. R. SUHRMANN and G. BARTH (Z. Physik, 1936, 103, 133—169).—A detailed account of work previously noted (cf. A., 1936, 144).

A. E. M.

Optical and crystallographic investigation of basic calcium salts. G. PEHRMAN and C. R. W. MYLIUS (Acta Acad. Aboensis Math. Phys., 1935, 8, No. 9, 10 pp.).—Optical properties were determined for

$\text{CaO}, \text{CaCl}_2, \text{H}_2\text{O}, 3\text{CaO}, \text{CaCl}_2, 15\text{H}_2\text{O},$
 $\text{CaO}, \text{Ca}(\text{NO}_3)_2, 3\text{H}_2\text{O}, 3\text{CaO}, \text{Ca}(\text{CNS})_2, 12.5\text{H}_2\text{O},$
 $3\text{CaO}, \text{Ca}(\text{ClO}_4)_2, 15\text{H}_2\text{O}, 3\text{CaO}, \text{CaI}_2, 15\text{H}_2\text{O},$
 $3\text{CaO}, \text{CaBr}_2, 15\text{H}_2\text{O}, \text{CaO}, \text{Ca}(\text{ClO}_4)_2, 3\text{H}_2\text{O},$ and
 $\text{CaO}, \text{CaBr}_2, 3\text{H}_2\text{O}.$

CH. ABS. (e)

Optical behaviour of fuchsin in polarised light. F. HLÚČKA (Z. Physik, 1936, 103, 246—249).—Reflexion of polarised light by fuchsin mirrors has been measured over the range 405—740 mμ. Results agree with those calc.

H. C. G.

Micro-plasticity in crystals of tin. B. CHALMERS (Proc. Roy. Soc., 1936, A, 156, 427—443).—The existence has been established of a type of plasticity below the point usually regarded as the yield point, and it is suggested that the creep of single crystals be classified as micro- or macro-creep, according to whether the stress is < or > the crit. stress. The phenomenon of micro-creep can be explained by an extension of Taylor's theory of fault propagation.

L. L. B.

Temperature variation of crystal plasticity. E. OROWAN (Z. Physik, 1936, 102, 112—118).—A criticism of Boas and Schmid (A., 1936, 928).

A. B. D. C.

Tensile properties of solid mercury, and a comparison with those of other metals at low temperatures. C. H. LANDER and J. V. HOWARD (Proc. Roy. Soc., 1936, A, 156, 411—426).—Solid Hg, within the temp. range -58° to -130° , has the same tensile properties as other metals; the load-extension diagrams show an "elastic line," a yield point, and a curve of plastic deformation which rises to a max. load and droops to fracture. As with other metals, Hg is strengthened by fall in temp. Of the other metals and alloys studied, Pb most resembles Hg.

L. L. B.

Macromolecular chemistry. H. STAUDINGER (Angew. Chem., 1936, 49, 801—813).—A lecture reviewing work on highly-polymerised substances.

E. S. H.

Influence of crystal type on chemical properties of polymorphic compounds. R. FRIOKE and E. VON RENNENKAMPEFF (Naturwiss., 1936, 24, 762).—The variation of the amphoteric properties of $\text{Al}(\text{OH})_3$ with the type of crystal in which it occurs was examined by determining the amounts of K^+ and PO_4^{4-} adsorbed from a solution of K_2HPO_4 by bohmite (I), bayerite (II), and hydrargillite (III). The mol. ratio of KOH to H_3PO_4 adsorbed was 0.66 for (I) and 1.23 for (II). (III) did not adsorb either KOH or H_3PO_4 . The ratio of acidic to basic dissociation const. of $\text{Al}(\text{OH})_3$ thus varies with the cryst. form.

A. J. M.

Resistance and thermo-electric properties of the transition metals. N. F. MOTT (Proc. Roy. Soc., 1936, A, 156, 368—382; cf. A., 1935, 1063).—Explanations are given in terms of the quantum theory of metals of the following phenomena: the decrease in the temp. coeff. of resistance of Pd and Pt at high temp.; the large negative thermo-electric power of Pd and Pt; the increase in the thermo-electric power of Pd when it is alloyed with Cu, Ag, Au, or H_2 ; and the sudden change in the temp. coeff. of resistance of ferromagnetics at the Curie point.

L. L. B.

Application of thermodynamics to superconductivity. A. J. RUTGERS (Physica, 1936, 3, 999—1005).

O. D. S.

Transition curve for the destruction of superconductivity [in tin] by an electric current. L. V. SCHUBNIKOV and N. E. ALEXEEVSKI (Nature, 1936, 138, 804).

L. S. T.

Magnetic anisotropy of rhombic sulphur. P. NILAKANTAN (Proc. Indian Acad. Sci., 1936, 4, A, 419—422).—Magnetic measurements are in general accord with X-ray measurements (A., 1935, 285) and support the theory that the S_8 mols. are puckered rings oriented with the plane parallel to the *c* axis of the crystal. The inclination of the plane to the *a* axis indicated by magnetic measurements is 70° instead of 50° as from X-ray measurements.

J. W. S.

Calculation of the magnetic moment of ions. G. FOEX and C. FEHRENBACH (Compt. rend., 1936,

203, 857—860).—The magnetisation of anhyd. CoCl_2 cooled rapidly from 600° is $(\chi + 4.72 \times 10^{-6}) \times (T - 18.4^\circ) = 0.0285$, yielding a Curie const. C of 27.0 magnetons. If the temp. is lowered slowly, however, the curve of $1/\chi T$ against $1/T$ forms two straight lines corresponding with $C = 25.67$ and 24.70 magnetons, respectively. This indicates that erroneous vals. of C can be obtained by use of Cabrera's formula $(\chi + a)(T - \theta) = C$. J. W. S.

Diamagnetism of some metallic halides. K. C. SUBRAMANIAM (Proc. Indian Acad. Sci., 1936, 4, A, 401—413).—The diamagnetic susceptibility (χ) of KCl , CdCl_2 , H_2O , CdBr_2 , CdI_2 , ZnI_2 , and HgCl_2 has been measured for the solid state and for aq. and MeOH solutions. MeOH solutions of HgCl_2 show no departure from the additive law, but in the other cases an increase in χ is obtained in solution, this being greatest for iodides and least for chlorides. This is attributed to the release of deformation of the ions by the action of the solvent, a view supported by the data for electrical conductivity and Raman effect. J. W. S.

Magnetic anisotropy of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in relation to its crystalline structure. I. K. S. KRISHNAN and A. MOOKHERJI (Physical Rev., 1936, [ii], 50, 860—863).—Measurements of magnetic anisotropy at 26° are reported. The crystal has an axis of approx. magnetic symmetry, the susceptibility along the axis being $<$ that along perpendicular directions by about 300×10^{-6} c.g.s.e.m.u. per g.-mol. The axis is inclined at 156° , 65° , and 52° , respectively, to the a , b , and c axes of the crystal. Results are discussed in relation to the known arrangement of H_2O and O around the Cu^{++} ions and the resulting cryst. electric fields acting on the latter. N. M. B.

Diamagnetic anisotropy of aromatic molecules. L. PAULING (J. Chem. Physics, 1936, 4, 673—678).—Vals. for C_6H_6 and other aromatic hydrocarbon mols. are calc. on the assumption that the p_z electrons (one for each aromatic C) move between adjacent C under the influence of the applied fields. Combined with assumed vals. for other electrons these vals. give the principal diamagnetic susceptibilities of several mols. in satisfactory agreement with experimental results. Graphite is also discussed. W. R. A.

Molecular diamagnetism of pyrrole and of some of its derivatives. G. B. BONINO and R. MANZONI-ANSIDEI (Ricerca Scient., 1936, [ii], 7, Reprint, 2 pp.).—The magnetic susceptibilities of $\text{C}_4\text{H}_5\text{N}$ and of 9 alkyl derivatives have been measured, and the mol. magnetism calc. Comparison of the latter with the vals. calc. by means of Pascal's additive relationship indicates that the $\text{C}_4\text{H}_5\text{N}$ nucleus contains no C:C linkings, but only single linkings. O. J. W.

Molecular diamagnetism of thiophen, furan, and their derivatives. G. B. BONINO and R. MANZONI-ANSIDEI (Ricerca Scient., 1936, [ii], 7, Reprint, 1 p.; cf. preceding abstract).—Magnetic measurements with $\text{C}_4\text{H}_4\text{S}$, $\text{C}_4\text{H}_4\text{O}$, and four derivatives indicate that also the $\text{C}_4\text{H}_4\text{S}$ and $\text{C}_4\text{H}_4\text{O}$ nuclei contain no C:C linkings. O. J. W.

Debye-Sears [liquid diffraction] effect. J. HRDLÍČKA, M. A. VALOUCH, and L. ZACHOVAL (Compt. rend., 1903, 203, 786—787).—Diffraction intensity measurements for xylene are recorded for $\lambda 5600 \text{ \AA}$. and a const. ultrasonic frequency of 2×10^6 , with various voltages applied to the quartz emitter. H. J. E.

Paramagnetic relaxation in a transversal magnetic field. C. J. GORTER (Physica, 1936, 3, 1006—1008; cf. A., 1936, 929).—The heat H liberated under the action of an alternating magnetic field by V and Fe alums and diluted Fe and Cr alums is decreased by the application of a const. transverse magnetic field. For V and Cr alums H is zero in a field of the order of 100 oersted. For Fe alums H is const. and small in fields > 4000 oersted. O. D. S.

Theory of absorption and dispersion in paramagnetic and dielectric media. C. J. GORTER and R. DE L. KRONIG (Physica, 1936, 3, 1009—1020).—General theory is developed and results for the alums are discussed (see preceding abstract). O. D. S.

Specific heats of metals at high temperatures. XXVI. Specific heats and electrical resistance of cerium. XXVII. Specific heats and electrical resistance of lanthanum. F. M. JAEGER, J. A. BOTTEMA, and E. ROSENBOHM (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 912—920, 921—927).—XXVI. New vals. of the mean sp. heat, C_p , of Ce at 320 — 530° (cf. A., 1935, 21) and differential heat capacity curves with respect to Cu show that transitions occur in Ce at 362° and 502° , and probably at $> 530^\circ$. Vals. of C_p at 380° and 480° are 7.338 and 7.773, respectively. By repeatedly raising the temp. of Ce to 540° and then cooling, the resistance-time curve finally becomes reproducible, and indicates transitions at 393° and 440° on the heating curve. The results are attributed to the coexistence of at least three modifications of Ce, each of which is stable only within a limited temp. interval. The data are further discussed.

XXVII. Differential heat-capacity curves of La with respect to Cu show that there are transitions in La at 548° , 665° , and 709° which are independent of preliminary thermal treatment. Vals. of the mean sp. heat, C_p , recorded show that the at. heat exceeds $3R$ g.-cal. at comparatively low temp. (cf. Ce). The resistance-time curves of La during heating show discontinuities at 421° and 560° , and the effect at 660° is connected with the transition at 709 — 715° . Preliminary treatment at 700° changes markedly the resistance-time curve. J. G. A. G.

Measurements of the atomic heats of platinum and copper from 1.2° to 20° abs. J. A. KOR and W. H. KEESOM (Physica, 1936, 3, 1035—1045).—For Pt the at. heat, C_v , is $D(233/T) + 0.001607T$ from 1.2° to 14° abs.; for Cu, C_v from 1.2° to 5° abs. is $D(335/T) + 0.001777T$. The electronic heat of Pt is several times $>$ the val. derived from Sommerfeld's formula for free electrons. The heat capacity of the conduction electrons in Cu is about 1.5 times the Sommerfeld val. corresponding with free $4s$ electrons. O. D. S.

Determination of the specific heat of gases at high temperatures by the sound velocity method. II. Carbon dioxide. G. G. SHERBATT and E. GRIFFITHS (Proc. Roy. Soc., 1936, A, 156, 504—517; cf. A., 1935, 155).—The vals. obtained for the sp. heats of CO_2 up to 1000° , working with three frequencies, are in satisfactory agreement with those deduced from spectroscopic data. The results of the sound absorption measurements support the Kneser theory (A., 1932, 684). L. L. B.

Thermal properties of helium, hydrogen, and deuterium. A. BIJL (Nature, 1936, 138, 723—724).—An equation for calculating sp. heat at temp. near 0° abs. when the velocity of sound is known is given. For H_2 and He, but not D_2 , experimental and calc. vals. agree satisfactorily. L. S. T.

Specific heats of liquids and gases. R. LUCAS (Compt. rend., 1936, 203, 773—774).—Theoretical. H. J. E.

Determination of the heat capacity of the chlorides of copper, lead, nickel, and iron at high temperatures. A. N. KRESTOVNIKOV and G. A. KARETNIKOV (J. Gen. Chem. Russ., 1936, 6, 955—961).—Vals. are recorded for the sp. heats of CuCl (15— 900° , solid and liquid), CuCl_2 (15— 500°), PbCl_2 (15— 800° , solid and liquid), ZnCl_2 (15— 300°), NiCl_2 (15— 800° ; a max.), and FeCl_2 (15— 700°). The latent heats of fusion of CuCl (25.7 g.-cal. per g.) and of PbCl_2 (10.7 g.-cal. per g.) are calc. J. J. B.

Differential method employing variable heaters for the determination of the specific heats of solutions, with results for ammonium nitrate at 25° . F. T. GUCKER, jun., F. D. AYRES, and T. R. RUBIN (J. Amer. Chem. Soc., 1936, 58, 2118—2126).—Apparatus and technique are described. In the concn. range 0.1—1.5M, the apparent mol. heat capacity of aq. NH_4NO_3 at 25° is a linear function of $[\text{NH}_4\text{NO}_3]$. At concns. up to 10.75M a hyperbolic second-degree equation for the apparent mol. heat capacity as a function of vol. concn.[†] reproduces the sp. heats with an average deviation of $\pm 0.0075\%$. The partial mol. heat capacities of NH_4NO_3 at different concns. have been calc. E. S. H.

Specific heat of a liquid at different temperatures. A. FERGUSON and A. H. COCKETT (Nature, 1936, 138, 842—843).—The sp. heat of a liquid can be measured by determining the electrical power required to maintain the temp. of a calorimeter and its contents stationary at different temp. above that of the surrounding medium. The vals. tabulated for H_2O and D_2O from 15° to 45° show that the sp. heat of D_2O is consistently $>$ that of H_2O , with a min. val. at approx. 41° . L. S. T.

Exchange of energy between organic molecules and solid surfaces. I. Accommodation coefficients and specific heats of hydrocarbon molecules. O. BEECK (J. Chem. Physics, 1936, 4, 680—689, 743).—A mol.-beam method was used to determine the accommodation coeffs. (α) of various hydrocarbon mols. Abs. vals. of α were obtained for paraffins from a relationship connecting α with sp. heat at const. pressure and mol. wt. Using trustworthy vals. for C_v , another equation for the

mean sp. heat between 20° and 140° is derived. From these two vals. of α were determined. Sp. heats were calc. for paraffin vapours by combining these results with the sp. heat of C_2H_6 from the normal frequencies. W. R. A.

Hindered rotation of methyl groups in ethane. J. D. KEMP and K. S. PITZER (J. Chem. Physics, 1936, 4, 749).—Discrepancies between experimental vals. of entropy and those calc. by statistical mechanics are probably due to the incorrect assumption of completely free rotation of the Me groups.

Entropy of carbon tetrachloride. R. C. LORD, jun., and E. R. BLANCHARD (J. Chem. Physics, 1936, 4, 707—710).—The entropy of CCl_4 at 298° and 348.5° abs., calc. from the Raman frequencies and from electron diffraction data, agrees with that derived from thermal measurements. In calculating from spectroscopic data the contribution of each of the five possible isotopic types is taken into account, using the accepted abundance ratio for Cl.

F. L. U.

B.p. of ethyl ether and its relation to pressure. M. WOJCIECHOWSKI (J. Res. Nat. Bur. Stand., 1936, 17, 459—461).—The b.p. of highly purified Et_2O is $34.481 \pm 0.003^\circ$, and dt/dp at 760 mm. is 0.0372° per mm. J. W. S.

Ebulliometric and tonometric measurements on normal aliphatic hydrocarbons. M. WOJCIECHOWSKI (J. Res. Nat. Bur. Stand., 1936, 17, 453—458).—Swientoslawski's method of measuring b.p. and the difference between the b.p. and condensation point of the vapours has been applied to the determination of the purity of hydrocarbons, their b.p., and the change of b.p. with pressure (dt/dp). The following data are recorded for b.p. and dt/dp (degrees per mm.): $n\text{-C}_5\text{H}_{12}$, 36.077° , 0.0391 ; $n\text{-C}_6\text{H}_{14}$, 68.733° , 0.0420 ; $n\text{-C}_7\text{H}_{16}$, 98.365° , 0.0449 ; $n\text{-C}_8\text{H}_{18}$, 125.658° , 0.0477 . J. W. S.

Empirical relation between the atomic dimensions and m.p. and sublimation points of the inert gases, halogens, and elements of the sulphur group. D. H. BRAUNS (J. Res. Nat. Bur. Stand., 1936, 17, 337—345).—Among elements of these groups which have analogous differences in at. structure, the differences in m.p. and in sublimation point at low pressure are both \propto the differences between the corresponding at. radii. J. W. S.

Heat of fusion and vapour pressure of stannic iodide. G. R. NEGISHI (J. Amer. Chem. Soc., 1936, 58, 2293—2296).— SnI_4 has m.p. $144.5 \pm 0.1^\circ$, mol. heat of vaporisation $13,750 \pm 50$ g.-cal., heat of fusion 4600 ± 20 g.-cal. per mol. The v.p. (160 — 250°) is given by $\log p_{\text{mm.}} = 7.6571 - 2971.36/T - 3689.1/T^2$; by extrapolation the b.p. is 348° . E. S. H.

Heat of fusion of stannic iodide. S. S. TODD and G. S. PARKS (J. Amer. Chem. Soc., 1936, 58, 2340).—The heat of fusion is 4530 g.-cal. per mol.

E. S. H.

M.p. and densities of tribasic alkaline-earth orthoarsenates. H. GUÉRIN (Compt. rend., 1936, 203, 997—998).—M.p. are: $\text{Ca}_3(\text{AsO}_4)_2$, 1455° ;

$\text{Sr}_3(\text{AsO}_4)_2$, 1635°; $\text{Ba}_3(\text{AsO}_4)_2$, 1605°, and $d = 3.620$, 4.601, 5.095, respectively. A. J. E. W.

Theory of phase transitions. L. LANDAU (Nature, 1936, 138, 840—841).—Conclusions reached from a mathematical treatment of transitions between liquids and crystals are discussed. L. S. T.

Distribution of temperature and vapour pressure in the neighbourhood of a water surface. R. D. GUPTA (Proc. Indian Acad. Sci., 1936, 4, A, 275—282).—Data are recorded and plotted for wind speeds of 0—2.5 m. per sec. For H_2O temp. > air temp. there are max. air-temp. fluctuations about 1 cm. above the surface. N. M. B.

Normal vapour pressure of crystalline iodine. L. J. GILLESPIE and L. H. D. FRASER (J. Amer. Chem. Soc., 1936, 58, 2260—2263).—Apparatus for determining the v.p. of I directly by means of a flexible metallic diaphragm, giving a precision of 0.004 mm., is described. Data are recorded for 30—60° and fit $\log_{10} p = -3512.830/T - 2.013 \log T + 13.37400$. The heat of sublimation of I at 25° is 14,880.7 g.-cal. per mol. E. S. H.

Vapour pressure of nitroglycerol. V. OHMAN and G. LAURENT (Svensk Kem. Tidskr., 1936, 48, 243—247).—V.p. between 10° and 40° varies from 0.019 to 0.206 mm. Hg. F. L. U.

Vapour pressure curve of lead tetraethyl from 0° to 70°. E. J. BUCKLER and R. G. W. NORRISH (J.C.S., 1936, 1567—1569).—The v.p. of PbEt_4 , determined by means of a hot-air-jacketed Bourdon gauge, between 0° and 67° is 0.056 and 6.293 mm. Hg, respectively. W. R. A.

"Internal thermodynamics." Z. RICHTMANN (Z. Physik, 1936, 101, 649—656).—Polemical, against Njegovan (*ibid.*, 1935, 98, 415). A. B. D. C.

Bernoulli's theorem. B. KRIES (Z. Physik, 1936, 101, 657).—This theorem is shown to lead to zero gas pressure on the walls of a container moving appropriately. A. B. D. C.

Temperature dependence of temperature-measuring quantities. V. JACZYNA (Z. Physik, 1936, 101, 785—786).—Particular cases are considered for a previous discussion (cf. A., 1936, 930). A. B. D. C.

Boyle temperature and a general equation of state. G. WOOLSEY (J. Amer. Chem. Soc., 1936, 58, 2229—2231).—Theoretical. E. S. H.

New equation of state. J. WEICHERTZ and B. GOUQUELL (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 121—125).—On the basis of formulæ for the fluidity of binary mixtures the expressions $v - v_1 =$ where $v = \text{vol.}$, $t = \text{temp.}$, $t_1 = 0$, and $v' = dv/dt$, and $1/(v_0 - v_1) - 1/(v_2 - v_1) = 1/[v_1'(p_1 - p_2)]$, where $p = \text{pressure}$, $v = v_0$ when $p = \infty$, and $v_1' = -dv_1/dp$, are proposed as equations of state. Good agreement is obtained with recorded vals. for the mol. diameter of Et_2O and EtOH calc. from v_0 . The Langmuir adsorption isotherm is derived. R. S. B.

Theory of liquids. VII. Diffusion and vapour pressure phenomena. T. S. WHEELER (Proc. Indian Acad. Sci., 1936, 4, A, 298—302; cf. this vol.,

34).—Satisfactory agreement with experimental data for some org. liquids is obtained. N. M. B.

Expansion pressures of metallic hydrogen and deuterium. A. R. UBBELOHDE (Nature, 1936, 138, 845).—X-Ray measurements show that the expansion pressures of H and D dissolved in Pd differ by approx. 7%. In certain hydrides, H is probably present in the metallic state, i.e., is dissolved as atoms and is partly dissociated into protons and electrons, and it exerts a considerable expansion pressure on the metal with which it is alloyed. L. S. T.

(A) **Heat conductivity of solid heat insulators.** (B) **Heat conductivity of electrical conductors.** A. S. PREDVODITELEV (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 813—837, 838—854).—A theory of heat conduction is developed and compared with experimental data. CH. ABS. (e)

Thermal conductivity of liquids. J. F. O. SMITH (Trans. Amer. Soc. Mech. Eng., 1936, 58, 719—724).—New data, collected from various sources, are given for various hydrocarbons of the paraffin and C_6H_6 series, various substituted derivatives thereof, chlorinated diphenyls, various alcohols, vegetable oils, etc. Theoretical and empirical equations for predicting thermal conductivities of liquids are discussed. R. B. C.

(A) **Atomistic theory of compressibility.** (B) **Elastic constants of the alkali halides.** J. A. WASASTJERNA (Soc. Sci. Fenn. Comm. Phys.-Math., 1935, 8, No. 8, 15 pp.; No. 9, 9 pp.).—(A) Vals. for the compressibility coeffs. of alkali halides are calc. and agree with those observed.

(B) Vals. for the elastic consts. are calc. Repulsive forces need be considered only between ions in contact. CH. ABS. (e)

Determination of viscosity of gases and Sutherland's constant. A. FORTIER (Compt. rend., 1936, 203, 711—712).—Accurate determinations of η for air over the temp. range -180° to 20° indicate variations in Sutherland's const. of 7—8% from the mean. A. J. E. W.

Temperature dependence of the viscosities of the tetrachlorides of the fourth group of the periodic system. G. P. LUTSCHINSKI (J. Phys. Chem. U.S.S.R., 1935, 6, 607—611).—The fluidities of CCl_4 (-10° to 70°), SiCl_4 (-15° to 40°), TiCl_4 (-15° to 50°), and SnCl_4 (-15° to 50°) are \propto the sp. vols. The η obey the Batschinsky formula (A., 1927, 195). CH. ABS. (e)

Thermal dissociation in liquid dielectrics. A. P. ALEXANDROV and A. M. ZOLOTAREVA (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 602—605).—The η and electrical conductivity, σ , of styrene polymerides are given as functions of temp. by $\eta = \eta_0 e^{A/T}$ and $\sigma = \sigma_0 e^{-A'/T}$, respectively, where A and A' vary for various polymerides. For a given polymeride $A > A'$. CH. ABS. (e)

Movement of liquids in an electric field. P. SOKOLOV and S. SOSINSKI (Acta Physicochim. U.R.S.S., 1936, 5, 433—450).—Mathematical. C. R. H.

Surface tension and refraction of the system ethylenediamine-water in relation to its other

properties. V. F. UST-KATSKHINTZEV (J. Phys. Chem. U.S.S.R., 1935, 6, 67—72).—The surface tension, σ , of $(\text{CH}_3\text{NH}_2)_2$ (0—60°) is given by $\sigma = 44.8 - 0.138t$. For its aq. mixtures the val. of $d\sigma/dt$ is a max. at 75% H_2O and a min. at 25% H_2O . The max. indicates the formation of a dihydrate. The existence of the monohydrate can be shown only by measurements of η and by thermal analysis.

CH. ABS. (e)

Electric conductivity of the system ethylene-diamine-water. V. F. UST-KATSKHINTZEV (J. Phys. Chem. U.S.S.R., 1934, 5, 1391—1396).—Measurements at 0—50° indicate the formation of a dihydrate at low temp.

CH. ABS. (e)

System dioxan and water. F. HOVORKA, R. A. SCHAEFER, and D. DREISBACH (J. Amer. Chem. Soc., 1936, 58, 2264—2267).— d , surface tension, and total v.p. have been determined at 10—80°, and n and the partial v.p. at 25°. The f.-p. curve has been studied.

E. S. H.

Electrical birefringence of mixtures of liquid oxygen and nitrogen. W. H. KEESOM and R. GUILLIEN (Physica, 1936, 3, 939—946).—Vals. of Kerr's const. B at 5461 Å. and temp. from 78.15° to 65° abs. have been measured for mixtures of liquid O_2 and N_2 . The curves showing the change of B with composition at 78.15° and 65° lie below those calc. according to the theory of Langevin. It would seem that the birefringence of O_2 is decreased by dilution and the sp. birefringence at infinite dilution is calc.

O. D. S.

Rotatory magnetic polarisation and magnetic birefringence of solutions of β -naphthol and 2-methylnaphthalene. J. RABINOVITCH (Compt. rend., 1936, 203, 991—994).—The magnetic rotatory power and magnetic birefringence of solutions of $\beta\text{-C}_{10}\text{H}_7\text{OH}$ in COMe_2 are linearly related to the concn. Deviations occur with solutions of 2- $\text{C}_{10}\text{H}_7\text{Me}$ in CCl_4 ; these are explained by assuming partial transformation into 1- $\text{C}_{10}\text{H}_7\text{Me}$.

A. J. E. W.

X-Ray spectrum analysis of copper-zinc alloys. V. KARTSCHAGIN and V. TOLMATSCHEV (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 183—191).—The absorption of X-rays of $\lambda\lambda$ 1.753—1.28 Å. by 0.4-mm. thick plates of Cu-Zn alloys placed in the beam has been measured.

CH. ABS. (e)

Molybdenum-carbon system. W. P. SYKES, K. R. VAN HORN, and C. M. TUCKER (Amer. Inst. Min. Met. Eng., Inst. Met. Div., 1935, Tech. Publ. 647, 14 pp.).—Mo dissolves 0.09% of C at 2100°. The β phase corresponding with Mo_2C has a homogeneity range between 5.3 and 6% C. The hexagonal close-packed β lattice is expanded by the interstitial introduction of C atoms in this range. The α - β eutectic (1.8% C) has m.p. 2200+25°. A high-C intermediate γ phase is met with in 5.36% C alloys which have been heated above 2450°. This predominates in the range 6—10% C, and appears as the solid product of the peritectic reaction in which β decomposes when heated above 2400°.

CH. ABS. (e)

Influence of valency electrons on the crystal structure of ternary magnesium alloys. F.

LAVES and H. WITTE (Metallwirts., 1936, 15, 840—842).—Examination of alloys across the section $\text{MgX}_2\text{-MgY}_2$ for various ternary systems indicates the existence of a relation analogous to the Hume-Rothery rule.

C. E. H.

Solid solutions of ferrous sulphide with sulphur, selenium, and arsenic. A. MICHEL (Compt. rend., 1936, 203, 1004—1006).—The solid solutions have been investigated magnetically, and by the Debye-Scherrer method of X-ray analysis. Solutions with very low non-metal content are feebly ferromagnetic and resemble FeS. The remainder are strongly ferromagnetic, and of the pyrrhotine type. No notable structural changes occur.

A. J. E. W.

Solid solutions between rhombohedral neutral carbonates of bivalent metals. I. A. FERRARI and C. COLLA (Gazzetta, 1936, 66, 571).—X-Ray measurements show that CoCO_3 is completely miscible with the carbonates of Zn, Mg, Mn, and Cd, and partly miscible with CaCO_3 ; ZnCO_3 is completely miscible with MnCO_3 and with CdCO_3 , and partly with CaCO_3 .

O. J. W.

Electrical properties of isomorphous mixtures of Rochelle salt. B. V. KURTSCHATOV (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 584—589).—The influence of temp. on the dielectric const. of mixtures containing 13.0, 16.9, 19.0, 19.8, 20.3, and 21.3 mol.-% of the corresponding NH_4 Na salt has been examined between 83° and 290° abs. The first four curves show max. at 240°, 205°, 195°, and 180° abs., respectively. The last two mixtures, and also ternary mixtures of the Na K, Na NH_4 , and Na Tl salts, show the seignetto-electric effect. The Tl salt reduces the seignetto-electric tendency.

CH. ABS. (e)

Electrical saturation and critical solution point. A. PIEKARA and B. PIEKARA (Compt. rend., 1936, 203, 1058—1060).—The variation of ϵ with the applied electric field for mixtures of PhNO_2 and C_6H_{14} shows abnormalities near the crit. solution temp. The effect is attributed to increased association of PhNO_2 .

A. J. E. W.

Equilibrium between liquid and gas at high pressures and temperatures. I. Solubility of hydrogen in individual hydrocarbons of the aromatic and the naphthenic series. V. V. IPATIEV, jun., and M. I. LEVIN (J. Phys. Chem. U.S.S.R., 1935, 6, 632—639).— H_2 is more sol. in alicyclic than in aromatic compounds and the solubility in the latter decreases with increase of the Me side-chains. At 100° and 100 kg. per sq. cm. the solubility accords with Henry's law, but at higher pressures it increases more rapidly than the pressure.

CH. ABS. (e)

Solubility in water of carbon dioxide in mixtures with hydrogen at pressures of 30 kg. per sq. cm. I. R. KRITSCHESKI, N. M. SHAVORONKOV, and V. A. EPELBAUM (J. Chem. Ind. Russ., 1936, 13, 975—979).—Solubility of CO_2 in H_2O is a linear function of the fugacity for mixtures containing 23—100% of CO_2 at pressures of 5—30 kg. per sq. cm., and at 0°, 20°, and 30°.

R. T.

Solubility of calcium hypochlorite in aqueous calcium chloride. M. E. POZIN and C. A. LEVINA (J. Chem. Ind. Russ., 1936, 13, 864—866).—The solubility of $\text{Ca}(\text{OCl})_2 \propto 1/[\text{CaCl}_2]$ at -10° to 18° ; it varies little with temp., but is least at 0° . R. T.

Aluminium iodide as a solvent. V. IZBEKOV and O. NISHNIK (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 189—209).—Solubilities at 200° are recorded for SbI_3 , SnI_4 , AsI_3 , I, HgI_2 , KI, NaI, NH_4I , AgI, CuI, CdI_2 , PbI_2 , BiI_3 , and NiI_2 . The max. conductivity of the systems diminishes in the order $\text{HgI}_2 > \text{KI} > \text{AgI} > \text{SbI}_3 > \text{CdI}_2 > \text{CuI} > \text{AsI}_3 > \text{I}$. Formation of complex compounds is postulated in these cases, but not in that of SnI_4 , solutions of which are non-conducting. Al_2O_3 reacts with AlI_3 to yield a feebly conducting gel. R. T.

Physical chemistry of amino-acids, peptides, and related substances. VII. Comparison of the solubility of amino-acids, peptides, and their derivatives. T. L. McMEERIN, E. J. COHN, and J. H. WEARE (J. Amer. Chem. Soc., 1936, 58, 2173—2181; cf. A., 1935, 695).—The logarithm of the solubility at 25° in any solvent relative to that in H_2O is increased by a const. amount for each CH_2 in hydrocarbon chains terminating in Me: 0.53 for BuOH and $\text{C}_7\text{H}_{15}\text{OH}$, 0.49 for COMe_2 and EtOH, 0.44 for MeOH, and 0.23 for $\text{HCO}\cdot\text{NH}_2$. The influence on the solubility ratio of the position of CH_2 groups in relation to polar groups has been investigated. The peptides of glycine, and other $\alpha\text{-NH}_2$ -acids and the hydantoic acids derived from them, are less sol. than glycine. Comparison of the peptides of glycine with their hydantoic acids reveals no change in solubility ratio with change in the dipole moment of the peptide. E. S. H.

(A) Partition coefficients of certain amines in the two-phase systems: water-ethyl alcohol-potassium carbonate and -ammonium sulphate. (B) Application of the two-phase systems water-ethyl alcohol-salt to extraction of solanine. A. G. KOBLJANSKI (J. Appl. Chem. Russ., 1936, 9, 1716—1720, 1721—1724).—(A) The partition coeffs. (C) of anions between the aq. and alcoholic layers of the system EtOH-aq. K_2CO_3 diminish in the order $\text{SO}_4^{4-} > \text{PO}_4^{3-} > \text{Cl}^- = \text{NO}_3^- > \text{ClO}_3^- > \text{Br}^- > \text{I}^- > \text{CNS}^-$, and in the system EtOH-aq. $(\text{NH}_4)_2\text{SO}_4$ (I) in the order $\text{PO}_4^{3-} > \text{Cl}^- > \text{OAc}^- = \text{NO}_3^- > \text{ClO}_3^- = \text{Br}^- > \text{I}^- > \text{CNS}^-$; these series correspond closely with the Hofmeister lyotropic series. The val. of C depends on the tenacity with which the anions retain H_2O of hydration.

(B) Solanine (II) is contained almost exclusively in the EtOH layer of the above systems ($C = 0.01$), and may be extracted by EtOH from aq. solutions containing < 0.5 mg. of (II) per litre. For the determination of (II) in potato, 180 g. of (I) in 300 ml. of H_2O are added to 150 g. of potato pulp, 3 ml. of AcOH are added, and the mass is shaken for 15 min. with 300 ml. of 95% EtOH; the upper layer is then removed and the residue twice extracted with 150-ml. portions of the upper layer of the system EtOH-aq. (I). The combined extracts are washed with saturated aq. Na_2CO_3 , and (II) is determined by the usual methods. R. T.

Diffusion of electrolytic hydrogen through metallic palladium. S. MAKAREVA (J. Phys. Chem. U.S.S.R., 1934, 5, 1380—1390).—With a c.d. of 0.004 amp. per sq. cm. at 20 – 25° all the H_2 evolved is found to diffuse through a 0.055-mm. Pd cathode when the outer surface of the latter is in contact with solutions of $\text{K}_2\text{Cr}_2\text{O}_7$, KIO_3 , or $\text{K}_3\text{Fe}(\text{CN})_6$ of concn. $> 0.05N$. Only 10% diffuses through at a c.d. of 0.1 amp. per sq. cm. CH. ABS. (e)

Passage of helium at ordinary temperature through glasses, crystals, and organic materials. (LORD) RAYLEIGH (Proc. Roy. Soc., 1936, A, 156, 350—357).—Experimental support has been obtained for the view of Alty (A., 1933, 565), that the passage of He through SiO_2 glass at room temp. is effected by a creeping of the gas mols. along the walls of submicroscopic channels. Fused B_2O_3 is comparable with SiO_2 glass in He transmission, and in both cases the addition of a base closes the channels, since neither borax glass nor ordinary glass transmits He. Various single crystals (including beryl, which has channels 2.6 Å. wide parallel to the axis) and light metals in the form of sheet were also examined, but in no case was any transmission of He detectable. On the other hand, Cellophane, gelatin, and celluloid transmit He much more freely than air. The He transmission of Cellophane is about the same as that of SiO_2 , but that of gelatin and of celluloid is much greater. L. L. B.

Diffusion of titanium and dissociation of titanium compounds. I. S. GAJEV (Metallurg, 1934, 9, No. 10, 19—33).—Ti begins to diffuse into the Fe lattice at 1300° . It forms a eutectic with Fe, m.p. 1340° . Ti carbides do not dissolve in the Fe solid solution up to 1300° and the nitrides are not sol. in molten steel at 1500° . CH. ABS. (e)

Theory of removal of gas from a metal at high temperature. I. A. ELTZIN (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 176—182). CH. ABS. (e)

Gas evolution from tungsten on heating in vacuo. S. V. PRITZIN (J. Tech. Phys. U.S.S.R., 1934, 4, 1189—1194).—The initial gas evolution is from surface layers. The later slow evolution is due to the large amount of energy needed for gas to pass through the W crystals. CH. ABS. (e)

Dependence of adsorption on the weight of adsorbent. T. P. PAKOVA-KVITZEL (J. Phys. Chem. U.S.S.R., 1934, 5, 900—914).—The adsorption of acid-violet B and Me-violet on positive and negative $\text{Al}(\text{OH})_3$ and on SiO_2 has been examined. The relations can be expressed by $x = km^{1/n}$ only when m is sufficiently large. In the system acid-violet B-negative $\text{Al}(\text{OH})_3$ the adsorption passes through two successive max. when m is decreased. For Me-violet- SiO_2 only one max. is observed. CH. ABS. (e)

Adsorption of gases at low pressures by lead chloride. F. DURAU and J. RECKERS (Z. Physik, 1936, 101, 755—767).—Data for N_2 , H_2 , CO, N_2O , CH_4 , C_2H_6 , C_3H_8 , C_2H_2 , and C_2H_4 show that these gases are adsorbed. There is no evidence of absorption or chemisorption. The heat of adsorption for C_2H_2 is compared with its heat of evaporation. A. B. D. C.

Adsorption of benzene, hexane, and acetone by lead chloride of known surface. F. DURAU and G. TSCHOEPE (*Z. Physik*, 1936, 102, 67—101).—Adsorption isotherms are shown to be very sensitive to traces of moisture. The isotherms for dry C_6H_6 , C_6H_{14} , and $COMe_2$ are linear in character and serve to emphasise the unimol. character of the adsorbed layers. The analogous nature of the adsorption and v.-p. formulæ is discussed. A. B. D. C.

Electrostatic and van der Waals adsorption of iodine on fluoride layers. J. F. H. CUSTERS and J. H. DE BOER (*Physica*, 1936, 3, 1021—1034; cf. A., 1933, 656).—The absorption spectra of layers of I adsorbed on SrF_2 and BaF_2 are similar to those of I on CaF_2 . The shift of the absorption bands towards the ultra-violet increases in the order BaF_2 , SrF_2 , CaF_2 . When the extent of occupation reaches 0.5% the absorption coeff. falls to a val. corresponding with that of free I, but it is still shifted towards the ultra-violet. It is inferred that up to this point adsorption is electrostatic, whilst van der Waals adsorption occurs when more of the surface is occupied. O. D. S.

Mechanism of desorption of solvent vapours from activated charcoal. II. Sorption of water vapour by silica gel and activated charcoal at temperatures above 100°. A. P. OKATOV and Z. I. LEVINA (*J. Appl. Chem. Russ.*, 1936, 9, 1814—1819).—The rate of adsorption and the maximally adsorbed amount of H_2O at 7 mm. pressure have been measured for anthracite charcoal and for SiO_2 gel between 101° and 150°. The gel adsorbs more strongly, especially above 120°, and the heat effect is > for charcoal. J. J. B.

Sorption by, and desorption from, activated charcoal of highly diluted nitrogen oxides. E. V. ALEXEEVSKI, G. M. MOSKVIN, and L. J. PODOSSEF (*J. Appl. Chem. Russ.*, 1936, 9, 1800—1813).—The adsorption of NO_2 has been studied statically at 21° and dynamically between 15° and 30°. The time (t) which elapses before the N oxides cease to be totally adsorbed from a streaming gas is found to increase when the rate of streaming, the % of H_2O vapour, and the temp. of the gas are lowered. The N oxides adsorbed may be removed by H_2O at 120—150°; at the same time the charcoal gives off much CO_2 and CO. The adsorbing power of the charcoal decreases after each sorption-desorption cycle; t is reduced by about one third after 6 cycles. J. J. B.

Dynamics of chemical adsorption. V. K. NIZOVKIN (*Trans. VI Mendeleev Congr.* (1932), 1935, 2, No. 1, 218—232).—Measurements have been made on the velocity of adsorption of I⁻ and Br⁻ by AgCl, CuCl, and HgCl. CH. ABS. (e)

Kinetics of surface processes in crystal lattices. III. Elementary processes of ionic migration at solid-liquid interfaces. L. IMRE (*Z. physikal. Chem.*, 1936, 177, 409—426).—Measurements of the rate of incorporation of Th-B from aq. solution into the surface of $PbCrO_4$ crystals agree with equations derived on the assumption that ions are directly incorporated by exchange processes of the Paneth type and by recrystallisation of the solid, these processes occurring simultaneously but independently

of each other, at approx. equal rates. The theory previously advanced (A., 1933, 679) that exchange is preceded by a true adsorption on the crystal is therefore untenable. R. C.

Inner adsorption in salt crystals. V. D. BALAREV with N. KOMAROV (*Z. anal. Chem.*, 1936, 107, 85—92; cf. A., 1935, 1316).—The author's views on the non-stoichiometric composition of (a) elementary crystallites forming the mosaic structure of macro-crystals, and (b) analytical ppts., are held to be supported by colorimetric p_H measurements on the mother-liquor from freshly pptd., unaged crystals. Crystallisation of KBr yields an alkaline mother-liquor and acid crystals, whilst pptn. of $BaSO_4$ yields an acid mother-liquor. The results are said to afford evidence of the universal contamination of "pure" crystals by their own ions, due to hydrolysis, and the presence of excess of H⁺ or OH⁻ as a consequence of deviation from stoichiometric composition. J. S. A.

Simon desorption method between temperatures of 90° and 40° abs. (Influence of equilibrium pressure.) A. VAN ITTERBEEK and W. VEREYCKEN (*Physica*, 1936, 3, 954—958; cf. A., 1936, 1084).—At 1 atm. pressure and 90° and 70° abs. reductions of 28.8° and 24.6° have been observed. At 5 atm. and 90° abs. a val. of 38.3° was found. O. D. S.

Elementary deduction of Gibbs' adsorption isotherm. E. A. GUGGENHEIM (*J. Chem. Physics*, 1936, 4, 689—695).—Mathematical. W. R. A.

Heats of adsorption at -183°. Carbon monoxide on copper. R. A. BEEBE, G. W. LOW, jun., and S. GOLDWASSER (*J. Amer. Chem. Soc.*, 1936, 58, 2196—2199).—Apparatus and technique for the direct measurement of the differential heats of adsorption at low temp. are described. The vals. are about 8 kg.-cal. per mol. in the initial stages, decreasing to about 3 kg.-cal. per mol. in the later stages of adsorption. A considerable part of the adsorption is of the activated type even at -183°. E. S. H.

Structure of the surface layer of a liquid. V. P. BERDENNIKOV, S. E. BRESLER, I. ZELMANOV, and E. A. SCHTRAUF (*J. Phys. Chem. U.S.S.R.*, 1934, 5, 584—590).—The surface layer of Hg, as determined by electron diffraction, is quasi-solid, with the hexagonal axis of the crystallites normal to the surface. CH. ABS. (e)

Phase-boundary forces at the boundary gas-liquid. V. Halogen-substituted aliphatic acids. Z. JOFA, A. FRUMKIN, and P. TSCHGUNOV (*Acta Physicochim. U.R.S.S.*, 1934, 1, 883—900).—The p.d. are plotted against concns. for EtCO₂H (I), α- (II), and β-chloro- (III), α-bromo- (IV), α- (V), and β-iodo- (VI) -propionic acid, PrⁿCO₂H (VII), α- (VIII), β- (IX), and γ-chloro- (X), and β-bromo- (XI) -butyric acid. For (I) and (VII) the p.d. rises sharply with increasing concn.; for (II), (VIII), and (XI) it rises and then falls, and for (III), (IV), (V), (VI), and (X) it decreases as the concn. increases. The negative influence of the halogen is the greater the farther it is removed from the CO₂H, is less the longer is the chain, and is in the order Cl > Br, I. The surface

tensions for the surface (Hg-solution) are almost identical for α - and β -substituted (I) and (VII), indicating that the mols. lie flat on the surface.

CH. ABS. (e)

Laminar systems. III. Kinetics of formation of copper hydroxide films on the surface of solutions of complex tetramminocopper salts. S. G. MOKRUSCHIN and P. S. KONJAEV. IV. Hardy effect and the stability of multimolecular layers of copper sulphides. S. G. MOKRUSCHIN, N. M. DEMJANOVA, and P. S. KONJAEV. V. Adsorption of electrolytes on films of copper sulphide. S. G. MOKRUSCHIN and G. F. VILESOVA (J. Phys. Chem. U.S.S.R., 1935, 6, 95—100, 100—106, 640—648; cf. A., 1936, 677).—III. Surface films with thicknesses from several mols. up to several thousand A. (determined optically) have been prepared by passing an air stream over the solution. The thickness \propto the velocity of the air stream and the temp.

IV. The breaking strength of the films was measured with an air blast. Addition of isoamyl alcohol decreases the strength of thick films, but has little effect on thin films. The film strength does not depend on thickness for vals. >30 mol. layers.

V. CuS films have been produced on the surface of CuSO_4 solutions containing NaCl, ZnSO_4 , and H_2SO_4 , and the adsorption of Cl^- and Zn^{++} measured. ZnSO_4 gives the films a cellular structure. Adsorption of Cl^- occurs between each layer of CuS mols. Zn^{++} ions are held as if Zn replaces Cu in the lattice.

CH. ABS. (e)

Surface tension of solutions of sugars at different liquid interfaces. N. S. STROGANOW (Protoplasma, 1935, 24, 431—452).—Different sugars lower the surface tension at the interface between H_2O and C_6H_6 , PhMe, light petroleum (I), or paraffin oil (II), the reduction increasing in the order: glucose, galactose, maltose, sucrose, lactose. With a H_2O -castor oil or H_2O -olive oil interface the order is different. In all cases the effect is least with C_6H_6 or PhMe, greater with (I), and greatest with (II).

M. A. B.

Surface activity and orientation of molecules in surface layers. IX. Surface activity of non-polar molecules of hydrocarbons. A. TAUBMANN (Acta Physicochim. U.R.S.S., 1936, 5, 355—380).—Measurements at 20° of the surface tensions of PhNO_2 solutions of *n*-hexane, *n*-heptane, *n*-octane, *iso*-amyl, CHCl_3 , cyclohexane, methylcyclohexane, C_6H_6 , PhMe, and xylene at the solution-air interface, and of paraffin solutions of C_6H_6 , PhMe, *p*-xylene, C_{10}H_8 (60°), Ph_2 (40°), and CHCl_3 at the solution- H_2O interface are recorded. An examination of various calc. adsorption consts. shows that non-polar mols., in contrast to polar mols., are oriented horizontally, the long sides of the C chains being parallel to the interface, so that for the upper members of a homologous series the area occupied by one mol. in the adsorption layer is $>$ for the lower members, the thickness of the layer remaining const. The differences between the observed vals. of γ and those calc. from the Langmuir-Szyszkowski equation are within experimental error. In a homologous series, increase

in surface activity follows the Traube rule, the coeff. for each CH_2 being 1.5, or approx. one third of the val. for vertical orientation.

C. R. H.

Movement of contaminated liquid surfaces. R. MERIGOUX (Compt. rend., 1936, 203, 848—849).—When H_2O is allowed to trickle down an inclined plane which dips into a basin of H_2O surface-contaminated with oleic acid, a heaping up of the H_2O is produced at the point where the acid film ends. The effect is attributed to friction between the film and the H_2O .

J. W. S.

Phenomenon of wetting films. C. W. CHAMBERLAIN and K. L. WARREN (J. Sci. Labs. Denison Univ., 1935, 30, 206).—Wetting films are formed by liquids containing two or more components of different vapour tensions. The thickness of such films increases with rise of temp. They have planes of cleavage which are exact multiples of the radius of mol. attraction.

CH. ABS. (e)

Hydrogen-ion concentration and behaviour and measurement of unimolecular and multimolecular films on water. W. D. HARKINS and R. J. MYERS (J. Chem. Physics, 1936, 4, 716—724).—An improved technique for the study of films spread on H_2O from a volatile solvent is described. The accuracy of the measurements is limited by errors in weighing the solution of the film-forming substance, and a wt.-pipette is described whereby these can be reduced to 0.25%. Surface pressure (F)-area per mol. (A) curves for $n\text{-C}_{13}\text{H}_{27}\cdot\text{CO}_2\text{H}$ are unaffected by changes in the rate of compression between 1 and 4 min., whilst intervals of >10 min. cause displacements due to dissolution of the film. Variation of $[\text{H}^+]$ does not change the F - A isothermals at 22° between p_{H} 2 and 6. At p_{H} 7.3 the film becomes expanded at low pressures, whilst it becomes quasisgaseous on 0.01*N*-NaOH. There is no simple relation between collapse pressure and $[\text{H}^+]$.

F. L. U.

Electro-osmotic researches on diaphragms. II. Influence of temperature on the transport numbers of ions in diaphragms and on their ζ -potential. III. Electro-osmotic researches on double diaphragms. I. I. SHUKOV and A. I. JURSHENKO (J. Appl. Chem. Russ., 1936, 9, 1733—1738, 1739—1744).—II. Observations have been made with 0.001*N*-KCl and with "marline" (cellulose) and earthenware diaphragms. The transport nos. are almost independent of temp. (10 — 80°), and the ζ -potential, measured electro-osmotically, increases slightly between 10° and 70° for the earthenware membrane.

III. Various ceramic diaphragms were covered on one side with gelatin layers of varying degrees of porosity, and the electro-osmosis of aq. HCl (p_{H} 1.684) through the "double diaphragms" thus formed has been examined. The diaphragms are always positive and the ζ -potential is higher when the gelatin layer is more conc. (4—24% gelatin) and the pores in the earthenware larger (130—220 $\text{m}\mu$). A theoretical explanation based on the role of the pore radius is given.

J. J. B.

Influence of an inert solid phase on the f.p. of water and dilute aqueous solutions. III.

Amount of freezable water in presence of quartz sand and starch. D. N. TARASENKOV and A. V. KOMANDIN (J. Gen. Chem. Russ., 1936, 6, 1147—1150).—The proportion of H_2O not freezing at 0° \propto total surface of the SiO_2 particles in unit vol., or to the concn. of starch, and may amount to 33% in the former, and to 70% in the latter, case. R. T.

Refraction of complex compounds of aluminium chloride and bromide in non-aqueous solvents. V. A. PLOTNIKOV and I. M. PODORVAN (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 159—166).—Mol. refractivity data for $AlCl_3$, $AlBr_3$, KCl , and $NaCl$ in $PhNO_2$, and $AlBr_3 \cdot H_2S$ in C_6H_6 and $EtBr$ differ from those found in H_2O or for the solid salts, suggesting formation of complexes with the solvents. R. T.

Compressibility of electrolyte solutions. C. BACHEM (Z. Physik, 1936, 101, 541—577).—Partial molar compressibilities have been measured by supersonic waves. The data agree with theory in so far as electrolytes of different valency types are concerned; this is not the case, however, for different electrolytes of the same valency type. A. B. D. C.

Relaxation effect in solution of strong electrolytes. E. N. GURYANOVA (J. Chem. Physics, 1934, 4, 741—743).—The effect is calc. by a simpler method than that used by Onsager and Fuoss (A., 1933, 28) but the results obtained are the same. F. L. U.

Dialysis in the study of colloids. III. Colloidal Prussian-blue. G. F. MANKODI, P. M. BARVE, and B. N. DESAI (Proc. Indian Acad. Sci., 1936, 4, A, 480—490; cf. A., 1934, 142, 362).—The cataphoretic velocity (V) of colloidal Prussian-blue (prep. by peptisation with $H_2C_2O_4$) first increases on dialysis and then decreases, whilst the stability, as determined by flocculation vals. with HCl , decreases continuously. On dilution, V shows a max. in some cases, but in others decreases continuously. The results are analogous to those obtained with Fe_2O_3 and ThO_2 sols. The changes of V with viscosity are not in accord with either Dhar's or von Smoluchowski's theories, but support the view of a crit. potential. V decreases on ageing and exposure to sunlight. J. W. S.

Application of ultrafiltration for the separation of colloids and crystalloids. B. ERSCHLER (J. Phys. Chem. U.S.S.R., 1934, 5, 1353—1365).—The retention of non-electrolyte crystalloids by a colloid membrane is small (2—3%) and independent of concn. That of electrolytes is 30—50% for 0.005*M* solutions and 2—3% for *M* solutions. CH. ABS. (e)

Theory of plastic flow of mineral suspensions. V. K. NIKIFOROV (J. Phys. Chem. U.S.S.R., 1935, 6, 92—94).—The η of clay suspensions <45% mineral content changes with time according to $\eta - \eta_0 \propto at$. CH. ABS. (e)

Essential properties of compact disperse substances. H. W. KOHLSCHUTTER (Kolloid-Z., 1936, 77, 229—238).—A lecture. Disperse systems are classified as "discrete disperse" and "compact disperse," according as the disperse phase is discontinuous, as in a sol, or partly continuous, as in a solid colloid. E. S. H.

Production of disperse metal [systems] by ultrasonic [vibrations]. B. CLAUS and E. SCHMIDT (Kolloid-Beih., 1936, 45, 41—59).—Emulsions of Na, K, and Hg in paraffin at 70° have been prepared by direct dispersion by means of ultrasonic waves. The decrease of particle size and the increase in the concn. of disperse phase which are associated with increasing duration of treatment have been investigated for Hg sols. Highly disperse hydrosols of Al, Cr, Fe, Ni, Cu, Zn, Ag, Cd, Pt, Au, Hg, Pb, and Bi have been prepared by the action of ultrasonic vibrations during the electrodeposition of these metals. E. S. H.

Arsenious sulphide sols in concentrated acids. H. A. WANNOW (Kolloid-Z., 1936, 77, 251).—See A., 1936, 1200. E. S. H.

Disperse gases. R. AUERBACH (Kolloid-Z., 1936, 77, 161—167).—Apparatus and technique are described. E. S. H.

Colloids obtained by the condensation of vapours. II. Organosols of metals of the first and second groups. E. B. FODMAN and V. A. KARGIN (J. Phys. Chem. U.S.S.R., 1934, 5, 423—430).—Metal sols were obtained by condensing the vapours into Et_2O . The sp. electrical conductivity of sols of K in Et_2O is \propto the dilution. The $[K']$ in the sol is $>$ that in the intermicellar liquid. K sols are more stable in Et_2O than in C_6H_6 . NH_2Et also gave good sols, but addition of 5% of cyclohexane gave a gel. Very unstable sols were also obtained with Cd, Zn, Ca, and Mg. CH. ABS. (e)

Formation of fog during distillation. D. BALAREV and N. KOLAROV (Z. anal. Chem., 1936, 107, 30—32).—The transport of ions during distillation is said to be the cause of the formation of fog in the process of ebullition. J. S. A.

Preparation of highly disperse aerosols of definite particle size by photochemical decomposition of mercury dimethyl. J. HARMS and G. JANDER (Kolloid-Z., 1936, 77, 267—269).—Aerosols have been prepared by photochemical decomp. of $HgMe_2$. The concn., particle no., and mean particle wt. have been determined as a function of ageing for sols of different initial concn. E. S. H.

Behaviour of colloid systems in ultra-high-frequency electromagnetic fields. B. RAJEWSKY and H. SCHAEFER (Kolloid-Z., 1936, 77, 257—260).—A lecture. E. S. H.

Influence of sonic and ultrasonic [vibrations] on aerosols. E. HEIDEMANN (Kolloid-Z., 1936, 77, 168—172).—Published work is discussed. E. S. H.

Viscosimetry of highly viscous lyophilic colloids. II. Application of viscosimeters based on Stokes' law. A. G. PASSINSKI and A. I. RABINOVITSCH (J. Phys. Chem. U.S.S.R., 1934, 5, 521—533; cf. A., 1935, 444).—The capillary and falling-sphere methods give concordant results if correction is made for differences in velocity gradients. Data for various 10—20% cellulose nitrate solutions are given. CH. ABS. (e)

Two conducting insulated spheres in a homogeneous electric field. W. KRASNY-ERGEN (Ann.

Physik, 1936, [v], 27, 459—471).—The distribution of the field when two conducting but insulated spheres are placed in a homogeneous electric field has been calc. Such spheres always tend to place themselves with the line joining their centres parallel to the direction of the field. This explains the "string of pearls" effect observed when some emulsions are submitted to the action of an alternating field. It is shown that the energy of the Brownian movement tending to break up the chains is about 10% < the electrical energy required to make them. A. J. M.

Highly polymerised compounds. CXLV. Osmotic pressure of methylcelluloses. G. V. SCHULZ (Z. physikal. Chem., 1936, 177, 453—459).—For aq. solutions of polymerhomologous methylcelluloses the val. of p/c , where p is the osmotic pressure and c the concn., passes through a max. and then through a min. as c increases. Up to a concn. of 0.5% the variation of p with c is normal and Staudinger's viscosity law is valid, indicating that the solute is present as simple thread mols. The anomalous variation of p with c at higher concns., the explanation of which is uncertain, is observed only with incompletely substituted carbohydrates containing OH groups. R. C.

Form of highly polymerised molecules in solution. G. LOB (Chem. Weekblad, 1936, 33, 707—716).—A review. S. G.

Spinning power of lyophilic colloidal solutions and the mechanical properties of threads formed from them. III. Spinning power of liquids. H. ERBRING (Kolloid-Z., 1936, 77, 213—219; cf. A., 1936, 1200).—A lecture. E. S. H.

Swelling and solubility of cellulose derivatives and their relations to dielectric constants. W. L. H. MOLL (Kolloid-Z., 1936, 77, 256; cf. A., 1936, 1461). E. S. H.

Breaking emulsions by freezing. T. G. ROCHOW and C. W. MASON (Ind. Eng. Chem., 1936, 28, 1296—1300).—A mixture of CCl_4 and C_6H_6 (d 1) with or without Na or NH_4Et_3 oleate as emulsifier was dispersed in H_2O , and the emulsion observed microscopically during freezing and subsequent thawing. The breaking of the emulsion by freezing can be explained by the withdrawal of free and/or combined H_2O from the films between droplets which are in contact as the result of the formation of ice or increase in the solute concn.; this is followed by true contact between adjacent films of emulsifier with loss of the orienting influence of H_2O . The emulsifier in the film diffuses from these regions and the film area decreases, with the result that the droplets coalesce as soon as thawing of the ice permits them to change shape. C. R. H.

Behaviour of heavy-metal soaps in organic solvents. E. NEYMAN (Kolloid-Z., 1936, 77, 270—272).—The behaviour of Co, Ni, Mn, and Ca palmitates, Co, Ni, and Mn oleates, and Co, Ni, Mn, and Al naphthenates in C_6H_6 , light petroleum, PhMe, CCl_4 , and decalin has been investigated. Ni and Co palmitates form gels which can be liquefied by shaking or warming. Stable jellies of naphthenates are formed in light petroleum. The variation of viscosity

with time for Co palmitate in C_6H_6 has been followed and a phenomenon resembling thixotropy observed.

E. S. H.

Non-spherical nature of colloidal particles in relation to the formation of jelly structure. S. PRAKASH (Proc. Indian Acad. Sci., 1936, 4, A, 332—344).—The fresh sol obtained by dissolving HgO in sulphosalicylic acid is non-birefringent, but the reversible dried powder when dispersed in H_2O shows birefringence which increases with the magnetic field and is almost directly \propto concn.; it diminishes markedly in presence of Cl^- , but increases in presence of Ba^{++} or NO_3^- . Peptisers and sensitisers, e.g., sucrose, glycerol, EtOH , and COMe_2 , decrease the birefringence, but carbamide produces no marked effect. The presence of org. substances decreases the anisotropy of the particles by the disintegration of larger aggregates to smaller isotropic units and by the formation of spherical micelles characterised by adsorbing layers of org. solutions around the originally anisotropic particles. Many jelly-forming sols do not show birefringence; hence non-spherical particles are not essential for jelly formation. Non-spherical lyophobic particles probably become isotropic by hydration under favourable conditions. N. M. B.

Total volume of the disperse phase in gelatin sols. B. V. ERSCHLER (J. Phys. Chem. U.S.S.R., 1934, 5, 574—583).—Measurements of the total vol. by the method of Polanyi differ greatly owing to adsorption and the Donnan effect. These effects can be avoided by using KIO_3 crystals. In 100 g. of $M\text{-NaCl}$ 1 g. of gelatin occupies a vol. of $1.155 \pm 4\%$ c.c.

CH. ABS. (e)

Condition of sparingly soluble substances in gels. I. Silver chromate in gelatin. R. R. KHANOLKAR, P. M. BARVE, and B. N. DESAI (Proc. Indian Acad. Sci., 1936, 4, A, 468—479).—By suitable adjustment of (i) temp., (ii) p_H of the gelatin, (iii) concn. of the reactants, and (iv) the amount of gelatin, the conductivity of mixed solutions of AgNO_3 and K_2CrO_4 in gelatin may (a) remain const. while the colour remains yellow, (b) decrease some time after the colour change, or (c) not change at all, in spite of the colour change. Similar relations have been observed for solutions of $\text{Pb}(\text{NO}_3)_2$ and KI in agar. J. W. S.

Colloidal state of cholesterol, cholesteryl esters, and lecithin. XII. Reduction-oxidation properties of cholesterol and its derivatives in the colloidal condition. I. REMESOV and O. SEPALOVA. XIII. Quasi-redox potential of cholesterol sols. I. REMESOV and J. ŠOST (Biochem. Z., 1936, 287, 345—357; 358—364).—XII. Cholesterol (I) in hydro-sols of sufficient concn. possesses reducing properties and can replace succinic acid in the Thunberg system. (I) is the factor present in muscle substrate which is responsible in the Thunberg system for the redox reaction, the latter disappearing on removal of (I) and reappearing on adding muscle-(I) sols. The effect of KCN solutions on the course of this reaction is due to its effect on the degree of dispersion and on the p_H of the medium.

XIII. Determinations of the potential of strongly buffered colloidal solutions of (I) in a N_2 atm. with platinised Pt and Au electrodes at varying p_H and

temp. and measurements of the "normal potential" by rapid electrometric titration with various redox systems (methylene-blue, benzoquinone, 0.002*N*-TiCl₃) lead to the view that such solutions have a measurable quasi-redox potential. P. W. C.

Refractive index of proteins.—See A., III, 8.

Determination of the sign of the electric potential and the isoelectric point of thin fibres. A. DUMANSKI and O. A. DUMANSKI (J. Phys. Chem. U.S.S.R., 1934, 5, 673—678; cf. A., 1934, 143).—The method is based on the cataphoresis of a suspended thread. The isoelectric point of a gelatin thread is at p_H 5.1. CH. ABS. (c)

Complex flocculation of the type, colloid zwitterion + cation + anion. H. G. B. DE JONG and G. G. P. SAUBERT (Biochem. Z., 1936, 288, 13—28).—Flocculation and coacervation are shown by systems of the above type, e.g., lecithin (or isoelectric gelatin) + CaCl₂ + NH₄ molybdate, although neither or only one of the inorg. salts will cause flocculation of the colloid. The nature of the complex is confirmed by electrophoresis. With sufficiently high [CaCl₂], a max. of 1 mol. of molybdate ion is combined with 1 mol. of lecithin, and the electro-neutrality suggests the simultaneous combination with 1 mol. of Ca. Consideration of the known types of colloidal complexes indicates the existence of three basic types, viz., zwitterion + zwitterion, cation + anion, and zwitterion + cation + anion. F. O. H.

Complex-flocculation and -coacervation of the type, colloid zwitterion + colloid anion + crystalloid cation. H. G. B. DE JONG and G. G. P. SAUBERT (Biochem. Z., 1936, 288, 1—12).—Complex formation, accompanied by flocculation, of the above three-component type of coacervate is exemplified by lecithin-Na arabinatate-La(NO₃)₃ systems. Complex formation probably occurs by co-ordination of the crystalloid cation and colloid anion to the negative and positive valencies of the zwitterion, respectively. F. O. H.

The macromolecule and the micelle as structural units in biological materials, with special reference to cellulose. G. L. CLARK (Cold Spring Harbor Symp., 1934, 2, 28—38).—A summary.

CH. ABS. (c)

Colloid science and radio technique. A. VON BUZAGH (Kolloid-Z., 1936, 77, 172—183).—A review of published work with particular reference to electron-tube cathodes. E. S. H.

Rate of exchange of hydroxyl hydrogen [for deuterium] in aqueous solution. J. C. JUNGERS and K. F. BONHOEFFER (Z. physikal. Chem., 1936, 177, 460—464).—Contrary to the findings of Orr (A., 1936, 1203), equilibrium in the exchange of D of D₂O for H in dissolved EtOH is established at a rate too rapid to be measured. R. C.

Dissociation constant of acetic acid and ionic product of solvent in water-ethyl alcohol mixtures. S. KILPI and H. WARSILA (Z. physikal. Chem., 1936, 177, 427—441).—The dissociation const., *K*, of AcOH in H₂O-EtOH mixtures and the acid-base ionic product of the solvent, *K*_s, have been calc.

from titration curves. Both fall rapidly with increasing EtOH concn. (c). With increasing *c* the titratability of AcOH passes through a min. Log *K* and log *K*_s are approx. linear functions of 1/(dielectric const.). The accuracy of the displacement titration of AcOH in NaOAc increases with *c*. R. C.

Dissociation constant of acetic acid in water-acetic acid mixtures. S. KILPI and A. MERETOJA (Z. physikal. Chem., 1936, 177, 442—452).—The dissociation const., *K*, has been calc. from the buffer capacity of the mixtures. The results for the more conc. solutions agree with the vals. for the ionic product of the solvent derived from the titration curve of *o*-NH₂·C₆H₄·CO₂H in glacial AcOH. In the more dil. solutions *K* increases with the acid concn. (c) partly because the ionic activity coeffs. fall with increasing electrolyte concn., but in the most conc. solutions *K* falls rapidly with increasing *c*. R. C.

Thermodynamic primary and secondary dissociation constants of maleic and fumaric acids. W. L. GERMAN, A. I. VOGEL, and G. H. JEFFERY (Phil. Mag., 1936, [vii], 22, 790—800).—Conductivity data for 0.0001—0.01*N*-maleic acid (I) and Na maleate lead to *K*₁ = 1.20 × 10⁻². Potentiometric titration data for (I) and for fumaric acid using the quinhydrone electrode have been also employed in evaluating the ionisation consts. and the inter-carboxylic distances. H. J. E.

Dissociation constants and structures of glutamic acid and its esters.—See A., II, 9.

Determination of calcium-ion concentration. II. **Dissociation of calcium lactate.** G. KILDE (Z. anorg. Chem., 1936, 229, 321—336; cf. A., 1934, 732).—The second dissociation const. *K* = [Ca²⁺][C₃H₅O₃']/[CaC₃H₅O₃'] of Ca lactate (I) has been derived from (a) the solubility of Ca(IO₃)₂·6H₂O in aq. (I), (b) electrometric data for solutions containing (I) and lactic acid, and (c) conductivity measurements. R. S.

Electrolytic dissociation of basic barium perchlorate. F. REIFF and A. MÜLLER (Z. anorg. Chem., 1936, 229, 300—304; cf. following abstract).—The transport nos., f.-p. depression, and [OH⁻] have been determined for various concns. of Ba(OH)ClO₄ (I). It is inferred that (I) is a strong electrolyte yielding Ba²⁺, OH⁻, and ClO₄⁻ together with some BaOH⁺. R. S.

Electrolytic dissociation of basic lead salts. F. REIFF and A. MÜLLER (Z. anorg. Chem., 1936, 229, 285—299).—Measurements of transport nos., f.-p. depression, and conductivity, and also electrometric data for [Pb²⁺], show that Pb(OH)ClO₄ (I) and Pb(OH)OAc(II) form the complex ion [Pb{Pb(OH)₂}]⁺. Neutral ion pairs are formed in conc. solution, together with double mols. in the case of (II). [Pb²⁺] increases on dilution, whilst [OH⁻] remains approx. const., in agreement with the equilibrium [Pb{Pb(OH)₂}]⁺ ⇌ Pb²⁺ + Pb(OH)₂, Pb(OH)₂ being only slightly dissociated. R. S.

Application of certain physical methods to the investigation of complexes in solution. R. TRÉHIN (Compt. rend., 1936, 203, 869—871).—The sp. refraction [*n*], sp. dispersion [*d*], and magnetic

rotatory power $[\omega]$ of equimol. solutions of NH_4HMoO_4 and malic acid show deviations, $\Delta[r]$, $\Delta[d]$, and $\Delta[\omega]$, from the vals. calc. from the corresponding vals. for the components, but the max. and min. deviations vary with concn. and cannot be explained in terms of the known complex in the solution. $\Delta[d]$ for mixtures of mannitol and H_3BO_3 show a max. at $2\text{C}_6\text{H}_{14}\text{O}_6\cdot\text{H}_3\text{BO}_3$. Substitution of H_3BO_3 by NaBO_2 produces two max. and a min., corresponding with the composition $\text{C}_6\text{H}_{14}\text{O}_6\cdot\text{NaBO}_2$. Aq. glycerol- H_3BO_3 and glycerol- NaBO_2 mixtures show min. $\Delta[r]$ at $\text{C}_3\text{H}_8\text{O}_3\cdot 2\text{H}_3\text{BO}_3$ and $\text{C}_3\text{H}_8\text{O}_3\cdot\text{NaBO}_2$, respectively. For other properties the significance of the max. and min. deviations is doubtful. J. W. S.

Properties of electrolytic solutions. R. M. FUOSS (Chem. Rev., 1935, 17, 27—42).—Interionic effects may be divided into long- and short-range interactions. The former may be treated by the Debye-Hückel time average method and the latter by the formal methods of the dissociation theory.

CH. ABS. (e)

Thermodynamics of aqueous indium sulphate solutions. E. M. HATTOX and T. DE VRIES (J. Amer. Chem. Soc., 1936, 58, 2126—2129).—E.m.f. for the cells $\text{In(s)}|\text{In}_2(\text{SO}_4)_3(\text{m})|\text{Hg}_2\text{SO}_4\text{-Hg}$ at 0—25°, and f.p. of dil. solutions of $\text{In}_2(\text{SO}_4)_3$ have been determined. The activity coeffs. and partial mol. heat contents of aq. $\text{In}_2(\text{SO}_4)_3$ have been derived, and from p_H vals. for aq. $\text{In}_2(\text{SO}_4)_3$ the hydrolysis const. has been calc. E. S. H.

Thermodynamic study of the lead-bismuth system. H. S. STRICKLER and H. SELTZ (J. Amer. Chem. Soc., 1936, 58, 2084—2093).—Methods for deducing the conditions of phase equilibria in binary systems from thermodynamic data are described. The activities and relative partial mol. heat contents of Pb and Bi in their liquid alloys and solid solutions have been determined and the equilibrium diagram has been revised. E. S. H.

Activity of sodium in dilute sodium amalgam. H. E. BENT and E. SWIFT, jun. (J. Amer. Chem. Soc., 1936, 58, 2216—2220).—The thermodynamic properties of dil. Na amalgams have been determined from concn. cells containing NaI in NHMe_2 as electrolyte. Vals. for the solubility of Na in Hg at 5—25° are recorded. Deviations from Raoult's law, observed in this system, are discussed. E. S. H.

Activity of sodium and mercury in solid sodium amalgams. H. E. BENT and A. F. FORZIATI (J. Amer. Chem. Soc., 1936, 58, 2220—2223).—E.m.f. measurements of cells in which one electrode is a dil. Na amalgam and the other a solid amalgam of varying composition have given data for the free energy of formation of NaHg_4 , NaHg_2 , NaHg , Na_3Hg_2 , and Na_3Hg . The activities of Na and Hg at all concns. have been calc. E. S. H.

Calculation of concentration of saturated solutions of two relatively insoluble salts having a common ion. E. POZNER (J. Gen. Chem. Russ., 1936, 6, 1101—1107).—Mathematical. R. T.

Hydrated magnesium nitrites. J. BUREAU (Compt. rend., 1936, 203, 999—1001).—An equilibrium diagram for the system $\text{Mg}(\text{NO}_2)_2\text{-H}_2\text{O}$ is

given. Hydrates with 3, 6, and $9\text{H}_2\text{O}$ occur as solid phases. A. J. E. W.

Phase equilibrium relations in the binary system sodium oxide-boric oxide, with measurements of the optical properties of the glasses. G. W. MOREY and H. E. MERWIN (J. Amer. Chem. Soc., 1936, 58, 2248—2254).—The system contains the compounds $2\text{Na}_2\text{O}\cdot\text{B}_2\text{O}_3$, $\text{Na}_2\text{O}\cdot\text{B}_2\text{O}_3$, $\text{Na}_2\text{O}\cdot 2\text{B}_2\text{O}_3$, $\text{Na}_2\text{O}\cdot 3\text{B}_2\text{O}_3$, and $\text{Na}_2\text{O}\cdot 4\text{B}_2\text{O}_3$. The existence of cryst. B_2O_3 is doubtful. Refractive dispersions of B_2O_3 , $\text{Na}_2\text{O}\cdot 2\text{B}_2\text{O}_3$, and $\text{Na}_2\text{O}\cdot 4\text{B}_2\text{O}_3$ have been determined. E. S. H.

Phase equilibria in hydrocarbon systems. XVII. Ethane-crystal oil system. B. H. SAGE, J. A. DAVIES, J. E. SHERBORNE, and W. N. LACEY (Ind. Eng. Chem., 1936, 28, 1328—1333).—The sp. vol. and sp. heats of six mixtures of C_2H_6 and crystal oil (d_{40}^{20} 0.8663) were determined and the thermodynamic behaviour of one of the mixtures was graphically represented. C. R. H.

Calculation of isotherms in three-phase systems. T. A. POPOVA (J. Phys. Chem. U.S.S.R., 1935, 6, 53—56).—A generalised system of 19 linear equations is derived to express the relations which characterise three-phase systems. It agrees with data for the Ti-Pb-Sn and Ti-Pb-Cd systems (A., 1933, 1008). CH. ABS. (e)

Equilibrium in the system $\text{AlCl}_3\text{-KCl-NaCl}$. V. A. PLOTNIKOV and U. I. SCHVARTZMAN (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 387—401).—The system $\text{AlCl}_3\text{-NaCl}$ shows a eutectic at 108° and 39 mol.-% NaCl; the eutectic for $\text{AlCl}_3\text{-KCl}$ is at 128° and 33 mol.-% KCl. For the ternary system the eutectic is at 89° and corresponds with 20.0 mol.-% NaCl + 16.5 mol.-% KCl. All the systems were examined only above 50 mol.-% AlCl_3 . J. J. B.

Transformations in the ternary system sulphur-lead-oxygen. G. G. URAZOV (Metallurg, 1935, 10, No. 3, 27—37).—A discussion.

CH. ABS. (e)

Reactions between solids in the system CaO-MgO-SiO_2 in the temperature range 600—1200°. N. W. TAYLOR and F. J. WILLIAMS (Bull. Geol. Soc. Amer., 1935, 46, 1121—1136).—All the anhyd. compounds in the system except merwinite can be obtained by heating mixtures of CaCO_3 , MgCO_3 , and quartz at 600°, 800°, 1000°, and 1200° for 20 hr. The various solid phases have been detected by X-ray methods. CH. ABS. (e)

Equilibria in the system $\text{NaClO}_3\text{-Na}_2\text{SO}_4\text{-H}_2\text{O}$. A. V. BABAEV (J. Gen. Chem. Russ., 1936, 6, 1144—1146).—Data for 0°, 20°, and 40° are recorded. R. T.

System cadmium oxalate, potassium oxalate, and water at 20—30°. W. C. VOSBURGH, I. G. NEWLIN, L. A. PUETTI, R. L. PECK, and R. DIEK (J. Amer. Chem. Soc., 1936, 58, 2079—2080).—The existence of the compounds $\text{K}_2\text{Cd}_3(\text{C}_2\text{O}_4)_{1+x}\text{H}_2\text{O}$ (where $x \geq 10$) and $\text{K}_2\text{Cd}(\text{C}_2\text{O}_4)_{0.3}(\text{or } 4)\text{H}_2\text{O}$ is indicated. E. S. H.

System nickel oxalate, potassium oxalate, and water at 30°. W. C. VOSBURGH, K. ISRAEL, and O. G. BIRCH (J. Amer. Chem. Soc., 1936, 58,

2282—2283).—Solid solutions and the compound $K_2Ni(C_2O_4)_2 \cdot xH_2O$ (where x is probably 4) are formed. E. S. H.

System $ZrO_2-SO_3-H_2O$: conditions for the existence of a new zirconium acid sulphate $Zr(SO_4)_2 \cdot H_2SO_4 \cdot 2H_2O$. (MLLE.) M. FALINSKI (Compt. rend., 1936, 203, 877—879).—The existence of the compound $Zr(SO_4)_2 \cdot H_2SO_4 \cdot 2H_2O$, is indicated by observations at 25°. It is obtained by adding 16—30 c.c. of H_2SO_4 to 10 g. of $ZrCl_2 \cdot 8H_2O$ in absence of H_2O , HCl being removed by keeping the mixture in vac. in presence of P_2O_5 and $NaOH$. J. W. S.

F.p. of the ternary system glycerol-methanol-water. H. B. FELDMAN and W. G. DAHLSTROM, jun. (Ind. Eng. Chem., 1936, 28, 1316—1317).—Isothermal curves are plotted on a triangular diagram. The advantages of such mixtures for antifreeze purposes are discussed. C. R. H.

Equilibrium $TiO_2-H_2-Ti_2O_3-H_2O$. N. NASU (Kinz.-no-Kenk., 1935, 12, 371—380).—The equilibrium has been studied at 749—1009°.

CH. ABS. (c)

Heat content and heat capacity of aqueous sodium chloride solutions. T. F. YOUNG and J. S. MACHIN (J. Amer. Chem. Soc., 1936, 58, 2254—2260).—Differential heats of dilution have been obtained by the chord-area method from calorimetric measurements at 0°, 12.5°, and 25°. The data are combined with published work to show that the apparent mol. heat capacity of $NaCl$ in aq. solution is not a linear function of \sqrt{c} . E. S. H.

Heat capacity of lithium carbonate from 16° to 300° abs. Entropy and heat of dissolution of lithium carbonate at 298° abs. Entropy of lithium ion. O. L. I. BROWN and W. M. LATIMER (J. Amer. Chem. Soc., 1936, 58, 2228—2231).—Heat capacity data are recorded. The entropy of Li_2CO_3 at 298.1° abs. is 21.60 e.u.; that of Li^+ is 4.6 e.u. The heat of dissolution of Li_2CO_3 in H_2O at 298.1° abs. is -4200 ± 200 g.-cal. per mol. E. S. H.

Heat capacity and entropy of potassium permanganate from 15° to 300° abs. Entropy and free energy of permanganate ion. O. L. I. BROWN, W. V. SMITH, and W. M. LATIMER (J. Amer. Chem. Soc., 1936, 58, 2144—2146).—Heat-capacity data are recorded. The entropy of $KMnO_4$ is 41.04 e.u.; that of MnO_4^- is 46.7 e.u. The calc. free energies of formation of $KMnO_4$ and MnO_4^- are $-169,200$ and $-100,060$ g.-cal. per mol., respectively. E. S. H.

Thermodynamic properties of zinc, cadmium, tin, and lead tellurides. J. H. McATEER and H. SELTZ (J. Amer. Chem. Soc., 1936, 58, 2081—2084).—E.m.f. measurements at 270—440° yield the following data: free energy of formation (g.-cal.): $ZnTe$ $-27,360$, $CdTe$ $-23,950$, $SnTe$ $-14,660$, $PbTe$ $-16,590$; heat of formation (g.-cal.): $ZnTe$ $-28,210$, $CdTe$ $-24,530$, $SnTe$ $-14,650$, $PbTe$ $-16,810$; entropy (g.-cal. per degree): $ZnTe$ -2.9 , $CdTe$ -2.0 , $SnTe$ 0.0 , $PbTe$ -1.0 . E. S. H.

Heats of dissociation of hexa-arylethanes. C. B. WOOSTER (J. Amer. Chem. Soc., 1936, 58, 2156—2160).—Vals. calc. from published data show

that the entropy of dissociation is not entirely independent of the nature of the aryl groups.

E. S. H.

Heat of combustion of isoprene and its polymerisation products. S. V. LEBEDEV, M. A. CHOCHLOVKIN, and A. V. KALETSHEVA (J. Appl. Chem. Russ., 1936, 9, 1605—1612).—Heats of combustion (C) for isoprene, a mixture of its dimerides, and the H_2O -sol. forms of its Na- and thermopolymerides show that the decrement in C in homologous series of hydrocarbons possessing conjugated double linkings is the same as for saturated hydrocarbons. R. T.

Constitution of organic compounds based on thermochemistry. A. GOSSELIN (Bull. Soc. chim., 1936, [v], 3, 2092—2107; cf. A., 1929, 143).—Heats of combustion of paraffins and aliphatic alcohols confirm the author's view of fundamental additivity. H. W.

Electrical conductivity of barium chloride and its variation with temperature. V. J. JEHU (Proc. Physical Soc., 1936, 48, 850—856).—Data are recorded for 0.01—0.001*N* solutions at 18—85°. Vals. of Λ_∞ have been obtained by Shedlovsky's method, and a formula connecting conductivity and temp. is given. Results, which are plotted graphically, support the Debye-Hückel-Onsager theory.

N. M. B.

Conductivity and cryoscopy of iodine solutions. V. A. PLOTNIKOV and V. P. TSCHALI (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 167—175).—The sp. conductivity of the system I-TII at 130° rises with increasing [TII], whilst that of I at 130° is unaffected by adding CHI_3 , or that of I-KI by adding HgI_2 . The association coeff. of TII in I at 111° falls, and of PI_3 rises, with increasing concn. Conductivity is due to dissociation of associated mols. of iodides, according to the reactions $(MI)_n \rightleftharpoons M_nI_{n-m} + mI'$; $(MI)_n \rightleftharpoons M_{n-m}I' + mM'$. R. T.

Electrochemical researches on the chlorides and the bromides of aluminium and antimony in nitrobenzene. V. A. PLOTNIKOV and R. G. VAISBERG (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 337—360).—The sp. conductivity of the systems $AlCl_3$, $AlBr_3$, and $SbBr_3-PhNO_2$ shows a min. val.; but there is no evidence of this in the system $SbCl_3-PhNO_2$. The conductivities of the isomeric ternary systems $AlCl_3-SbBr_3-PhNO_2$ and $AlBr_3-SbCl_3-PhNO_2$ have also been examined.

J. J. B.

Electrochemical properties of the systems $AlBr_3-MeNO_2$, $LiCl-AlBr_3-MeNO_2$, $KCl-AlBr_3-MeNO_2$. J. P. MESHENNI (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 361—374).—Solutions of $AlBr_3$ in $MeNO_2$ dissolve 1 mol. of $LiCl$ or KCl per mol. of $AlBr_3$. The electrical conductivity and the decomp. potential of these solutions have been studied. On electrolysis metallic Li or K is deposited.

J. J. B.

Electrochemical researches on the systems aluminium bromide-ethyl iodide-silver or copper halides. V. A. PLOTNIKOV and I. L. KATZNELSON (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 303—335).—The sp. conductivity (κ) of

AlBr_3 - EtI mixtures shows a max. when the molar ratio $\text{AlBr}_3/\text{EtI} = 0.45$. When AgCl , AgBr , AgI , CuCl , CuBr , or CuI is added κ increases when this ratio is smaller and decreases when it is larger. For the best conducting mixtures κ is raised by the Ag salts and reduced by the Cu salts. The temp. coeff. of κ is always positive. The decomp. potential (λ) of AlBr_3 in EtI is not const. For solutions of various Ag salts it has the same val. and seems to correspond with λ for AgI ; a similar relation holds for solutions of Cu salts. J. J. B.

Electrochemical study of the systems (A) AlBr_3 - AsBr_3 in ethyl bromide, (B) AlBr_3 - NaI in benzene. V. A. PLOTNIKOV and S. I. JAKUBSON. (C) Electrolysis of benzene-nitrobenzene solutions of potassium and aluminium bromides. V. A. PLOTNIKOV and O. K. KUDRA. (D) Electrochemical and cryoscopic study of the systems AlBr_3 - SnBr_4 and $-\text{RbCl}$ in benzene. V. A. PLOTNIKOV and I. B. BARMASCHENKO. (E) Electrochemical study of the systems alkali chlorides-aluminium bromide-nitrobenzene. J. P. MESHENNI (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 131-138, 139-145, 147-151, 177-187, 211-236).—(A) The sp. conductivity (κ) falls with time after mixing, probably as a result of the process: $\text{AlBr}_3, \text{AsBr}_3, \text{EtBr} \rightarrow \text{AlBr}_3, \text{AsBr}_3 + \text{EtBr}$. During electrolysis As is deposited at the cathode, and Br at the anode.

(B) Max. κ is found when $[\text{NaI}]/[\text{AlBr}_3] = 0.5$, and cryoscopic measurements indicate considerable formation of a polymerisation complex, of the approx. composition $[\text{NaI}, 2\text{AlBr}_3, n\text{C}_6\text{H}_6]_m$. Al is deposited at the cathode, and Br and I at the anode; the decomp. potentials are 1.08 and 1.78 volts, corresponding with those of AlI_3 and AlBr_3 .

(C) The yields of K obtained by electrolysis of KBr-AlBr_3 in C_6H_6 - $\text{PhNO}_2 \propto [\text{KBr}]$, and rise to a max. of 47% with a mixture containing KBr 2.05, AlBr_3 11.08, C_6H_6 6.34, and PhNO_2 7.31 g.

(D) The system AlBr_3 - SnBr_4 - C_6H_6 is non-conducting, and the components are not associated. Electrolysis of the system AlBr_3 - RbCl - C_6H_6 results in liberation of Br at the anode, and of a black, spongy mass, containing Al crystallites, at the cathode. Mol. wt. data suggest formation of a complex, probably $4\text{AlBr}_3, \text{RbCl}$.

(E) κ of AlBr_3 in C_6H_6 rises with increasing $[\text{MCl}]$ ($\text{M} = \text{H}, \text{Li}, \text{Na}, \text{K}$) to a max. at $\text{AlBr}_3 : \text{MCl} = 1$, suggesting formation of 1 : 1 complexes. The decomp. potentials rise with increasing at. wt. of M . Alkali metal is liberated at the cathode during electrolysis. R. T.

Electrochemical researches on sulphur derivatives of silver. P. FISHER (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 375-385).—Conductivity and transport data have been obtained for solid mixtures of Ag_2S with PbS or CuS . A theoretical explanation of the results is attempted. J. J. B.

Theoretical studies of the electrode potential. II. Theoretical estimation of standard potentials. S. MAKISHIMA (J. Chem. Soc. Japan, 1935, 56, 923-935).—There is no direct relationship be-

tween the electrochemical series of potentials in N -sulphate solutions and the Volta contact potential series. CH. ABS. (e)

Electrometric potential and constitution of electrolytes. S. VEIL (Compt. rend., 1936, 203, 928-930).—The electrometric potentials (cf. A., 1936, 292) of saturated solutions of metallic nitrates show periodic variation with the at. wt. of the metal, in approx. correspondence with the periodic table.

A. J. E. W.

Zinc and zinc amalgam electrodes. W. J. CLAYTON and W. C. VOSBURGH (J. Amer. Chem. Soc., 1936, 58, 2093-2096).—No difference of potential has been found between the electrodes (1) Zn , (2) saturated Zn amalgam, and (3) superficially amalgamated Zn in solutions containing Zn^{++} . E. S. H.

Thermal type silver-silver chloride electrodes. C. K. RULE and V. K. LA MER (J. Amer. Chem. Soc., 1936, 58, 2339-2340).—Electrodes formed by electrically heating a Pt wire coated with a paste of Ag_2O and AgClO_3 give const., reproducible e.m.f.

E. S. H.

Reversible nickel electrode and its applications to the study of colloidal solutions. N. M. DESCHALIT, P. S. VASILIEV, and A. I. RABINOVITSCH (J. Phys. Chem. U.S.S.R., 1934, 5, 534-547).—The e.m.f. of the cell $\text{Ni}|\text{NiSO}_4 (M)|\text{KCl (saturated)}|\text{HgCl}|\text{Hg}$ varies in the presence of air from 110 to 280 mv. In the absence of O_2 it is const. = 185 mv. at 20° . CH. ABS. (e)

Reversibility of potential of a polarisable hydrogen electrode. V. V. SCHISCHKIN, I. P. MATVEITSCHUK, and I. I. GECHT (J. Phys. Chem. U.S.S.R., 1934, 5, 126-132).—Data for the cell H_2 , platinised $\text{Pt}|\text{Hg}_2\text{SO}_4, 2N\text{-H}_2\text{SO}_4|\text{Hg}$ at H_2 pressures of 1-100 atm. show that the potential of a polarised electrode at vals. \neq the equilibrium polarisation potential is independent of the pressure.

CH. ABS. (e)

Photo-voltaic effect for sodium. R. B. GIBNEY and M. DOLE (J. Chem. Physics, 1936, 4, 653-657).—Reversible electrodes of Na dipping into a solution containing Na^+ ions failed to produce a photovoltaic effect when the solution was carefully dried before preparing the cells. Slight effects were observed when the cells contained traces of H_2O , but these are attributed to the H_2O or to the compound electrode $\text{Na}|\text{Na}_2\text{O}$. The energy supplied to the electrodes by visible light appears to be insufficient to cause the transfer of the electron from metal to solution. W. R. A.

Oxidation-reduction potential of *p*-methylaminophenol. S. G. BOGDANOV (J. Phys. Chem. U.S.S.R., 1934, 5, 1445-1451).—Vals. for the system $p\text{-NHMe-C}_6\text{H}_4\text{-OH-p-methylbenzoquinoneimine}$ in a buffer mixture of H_3BO_3 , NaOH , and KCl are 243 mv. at p_H 7.57, 191 at 8.37, 142 at 8.94, 120 at 9.65, and 104 at 10.0. CH. ABS. (e)

Energy levels in electrochemistry. II. W. D. BANCROFT and J. E. MAGOFFIN (J. Amer. Chem. Soc., 1936, 58, 2187-2189; cf. A., 1936, 293).—The e.m.f. of a cysteine-cystine electrode is theoretically a function of temp., p_H , and cysteine

concn., but not of cystine concn. If an electron transfer between an inert metal and an oxidisable or reducible substance involves the passage through an energy hump, a reduction or oxidation potential characteristic of that substance will not be set up. In other circumstances the characteristic potential should be observable.

E. S. H.

Construction of two-liquid cells containing gelatin. S. VEIL (Compt. rend., 1936, 203, 1060—1061; cf. A., 1936, 292, 800).—Cells of the type Pt-solution I-gelatin-solution II-Pt are discussed. A formula for the e.m.f. is given for the case when the two solutions contain the same electrolyte at different concns.

A. J. E. W.

Diffusion of hydrogen through metallic cathodes. L. E. SABININA and L. A. POLONSKAJA (J. Phys. Chem. U.S.S.R., 1935, 6, 107—113).—The rate of diffusion was measured by the change of pressure in a hollow Fe cylinder, previously evacuated and then subjected to electrolytic polarisation in 1*N*- and 0.1*N*-H₂SO₄ solutions. Addition of 0.001 g.-mol. of the oxides of K, Sn, Pb, Hg, and Pd per litre of solution was found to change the rate of diffusion.

CH. ABS. (e)

Hydrogen film on a polarised metallic cathode. G. PERFILIEV (Sotz. Rekonstr. i Nauka, 1935, No. 3, 168).—The polarisation capacity of the H film formed on the electrode in cathodic polarisation depends on the density and frequency of the a.c. The dependence of the capacity of the Hg cathode on the potential gives a curve with a min. The H overvoltage falls with increase in the capacity.

CH. ABS. (e)

Overvoltage phenomena in the electrolytic deposition of metals on an indifferent electrode. A. G. SAMARTZEV and K. S. EVSTROPIEV (J. Phys. Chem. U.S.S.R., 1934, 5, 854—862).—The polarisation of smooth and of platinised Pt electrodes has been studied in aq. solutions of CdSO₄, salts of Cu, Pb, Hg, and Ag, and in a C₂H₅N solution of AgNO₃ at 20—60°. The potential-time curves always show a min., which is enhanced by the addition of sucrose in the case of CdSO₄. The neutralisation of ions and deposition of metal atoms on the electrode is shown to be a single-step process.

CH. ABS. (e)

Factor of pressure in the overvoltage phenomenon for hydrogen. V. V. IPATIEV, jun., V. V. SCHISCHKIN, G. A. POLEV, and I. A. DUBKOV (J. Phys. Chem. U.S.S.R., 1934, 5, 1114—1124).—The influence of pressure on the polarisation at a platinised Pt surface has been studied in the cells Pt|2*N*-H₂SO₄, Hg₂SO₄|Hg and Pt|4*N*-NaOH, HgO|Hg. The potential increases with the pressure in both cases, but the normal thermodynamic formula is not applicable. The pressure affects the concn. of the surface layer of the electrolyte solution.

CH. ABS. (e)

X-Ray study of surface Al-Cu alloys, formed in a galvanic element. D. P. ZOSIMOVITSCH, M. V. BUTSCHKOVSKI, and O. M. BRENAIZEN (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 237—246).—The amount of Al which combines with Cu in the action of the cell Al|AlCl₃-NaCl|Cu rises with the temp. from

200° to 550°. α-Cu-Al is formed at 200—300°, and transition to the γ-alloy takes place at 300—350°. β-Cu-Al was not found.

R. T.

Electrolysis of sodium nitrite in liquid ammonia. E. I. ACHUMOV and N. V. DERJABINA (J. Gen. Chem. Russ., 1936, 6, 1157—1165).—The solid phases separating from liquid NH₃ are: NH₃ at < -85°; NH₃ and 2NaNO₂.NH₃ (I) at -87.5°; (I) separates at -82° to -64°, and NaNO₂ at -64° to 172°. On electrolysis the reaction Na + NH₃ → NaNH₂ + H occurs at the cathode and 6NH₃ → 4NH₃ + N₂, NH₄' + NO₂' → NH₄NO₂ at the anode.

R. T.

Conductivity of calcium hydrogen carbonate and the determination of sulphate and total hardness in natural waters by electrical conductivity. W. NUMANN (Naturwiss., 1936, 24, 693—696).—The conductivity of solutions of Ca(HCO₃)₂ has been measured. In determining the hardness of H₂O, the total conductivity is first found, and the temporary hardness is then converted into CaCl₂ by titration with 0.1*N*-HCl, after which the conductivity is again found. From the known conductivity of CaCl₂ solutions, and the difference between the conductivities before and after the titration, it is possible to calculate the conductivity due to electrolytes, other than Ca(HCO₃)₂, which have been unaffected by the titration. The amount of CaSO₄ can thus be found.

A. J. M.

Absolute rate of a chemical reaction: formal thermodynamic treatment. W. H. RODEBUSH (J. Chem. Physics, 1936, 4, 744—746).—The thermodynamic method is applied to the rate of racemisation of Ph₂ derivatives.

F. L. U.

Absolute rates of four-atom reactions. W. ALTAR and H. EYRING (J. Chem. Physics, 1936, 4, 661—673).—Equipotential surfaces are discussed in a "bond space" instead of in a configuration space, with a resulting simplification in treating such problems. The exchange part, as well as the coulombic part, of bond energies obeys a simple vector addition rule. The four-atom reaction without symmetry, H₂ + ICl → HI + HCl, is fully dealt with and the results are compared with existing data.

W. R. A.

Ignition of explosive gases. G. MOLE (Proc. Physical Soc., 1936, 48, 857—864).—Mathematical. The activation theory of gases, expressed mathematically, leads to a general differential ignition equation which resembles that for the state of an ignitable mixture, and yields solutions agreeing closely with the fundamental phenomena of ignition.

N. M. B.

Ignition of detonating gas [mixtures] at low pressure. P. TAUZIN (Ann. Physique, 1936, [xi], 6, 575—662).—Using H₂-O₂ mixtures in glass or SiO₂ tubes at approx. 500° and an ignition pressure range of 0—30 cm. Hg, the influence of ignition tube vol., presence of inert gas, and H₂:O₂ vol. ratio on the limiting pressures and *p*₂ between which ignition takes place has been investigated. The place of origin of ignition was studied photographically. If ignition originates at the tube wall it propagates at a rate > 1000 m. per sec., and flame duration is of

the order 0.001 sec. The flame spectrum shows OH bands, a faint continuous spectrum, and a red line, probably H_2 . Possible theories, especially those of Hinshelwood and Semenov, are discussed. Reports that ignitions have been effected at atm. pressure are considered doubtful. N. M. B.

Function of electrically-charged particles in the propagation of flames. I. Propagation of flames in a transverse electric field. B. SKALOV and A. SOKOLIK (J. Phys. Chem. U.S.S.R., 1934, 5, 617—624).—In a 25% CO-air mixture the flame velocity was almost const. for transverse fields up to 11 kv. At 14 kv. the flame was extinguished. In a 44% CO mixture the velocity was a max. at 6 kv. at 400 mm. and at 9 kv. at 60 mm. pressure. A 27% C_2H_2 -air mixture gave a constantly decreasing velocity with increase in the applied voltage. A 5% C_6H_6 -air mixture gave extinction at 4 kv. at 400 mm. and 3 kv. at 600 mm. pressure. CH. ABS. (e)

Rate of oxidation of carbon monoxide in presence of nitrogen dioxide. R. H. CRIST and G. M. CALHOUN (J. Chem. Physics, 1936, 4, 696).—Using reaction vessels of different materials, the reaction at low pressures of NO_2 is affected considerably by surface-vol. ratio and by the material of the reaction vessel. At higher $[NO_2]$ the nature of the reaction vessel did not affect the reaction. The reaction is independent of $[CO]$, and otherwise in accordance with $-dO_2/dt = k[NO]^2[O_2]$, provided that $[NO]$ is not too great. W. R. A.

Kinetics of OH radicals as determined by their absorption spectra. I. Electric discharge through water vapour. A. A. FROST and O. OLDENBERG (J. Chem. Physics, 1936, 4, 642—648).—The order of the reaction causing the rapid disappearance of OH radicals is measured by photometry of absorption spectra taken in snapshots. Relative concns. of OH radicals are derived. The decay of $[OH]$ with time for various H_2O pressures and addition of He is given. The results are explained by triple collisions consuming OH. No appreciable amounts of H_2O_2 are formed. W. R. A.

Rate of thermal decomposition of deuterium iodide. J. C. L. BLAGG and G. M. MURPHY (J. Chem. Physics, 1936, 4, 631—638).—The partition functions for DI are calc. from 300° to 1500° abs. and an equation is obtained giving the free energy function at temp. within this range. These data are combined with those for the other mols. involved, and the equilibrium consts. for the exchange reaction and for the decomp. of DI are calc. The experimental ratio of the rate consts. for $HI \rightarrow 0.5H_2$, $0.5I_2$, and $DI \rightarrow 0.5D_2 + 0.5I_2$ is compared with the theoretical val. Contrary to expectation, it is $<$ the predicted val. W. R. A.

Thermal decomposition of acetaldehyde and ethylene oxide. R. V. SEDDON and M. W. TRAVERS (Proc. Roy. Soc., 1936, A, 156, 234—269).—The main product of the thermal decomp. of $(CH_3)_2O$ between 380° and 420° is CH_4 and CO_2 , the latter always in excess. MeCHO between 360° and 500° also gives rise to these compounds, but a second reaction gives C_3H_6 , H_2O , and CO. With $(CH_3)_2O$

the second reaction gives C_2H_4 , H_2 , and CO. Condensation products are formed in both cases by the hydrocarbons. The rate of decomp. of MeCHO is independent of the nature of the reaction vessel, owing to the fact that the main reaction is diminished when the surface is increased, and the secondary reaction correspondingly accelerated. The decomp. of $(CH_3)_2O$ is not influenced by the surface, and the two reactions operate in the gas phase. The temp. coeff. of thermal decomp. for $(CH_3)_2O$ is $>$ that for MeCHO. L. L. B.

Rupture of carbon-nitrogen bonds. Kinetics of the thermal decomposition of ω -azotoluene vapour. A. WILLIAMS and A. S. C. LAWRENCE (Proc. Roy. Soc., 1936, A, 156, 455—462).—Over the pressure range 2.5—11 mm. and the temp. range 187—238°, the thermal decomp. of ω -azotoluene is homogeneous and of the first order, having an activation energy of approx. 35,000 g.-cal. per g.-mol., distributed over 15 degrees of freedom. Comparison of the azine and azo decomp. shows that the activation energy required for the rupture of the C:N linking is considerably $>$ that for the C-N linking. L. L. B.

Kinetics of the thermal decomposition of benzylideneazine vapour. A. WILLIAMS and A. S. C. LAWRENCE (Proc. Roy. Soc., 1936, A, 156, 444—455).—The thermal decomp. of benzylideneazine vapour [75% N_2 and $(CHPh)_2$] is a homogeneous reaction between 318° and 354°, and is of the first order over the pressure range 5—380 mm. The energy of activation is 53,000 g.-cal. per g.-mol. approx., and is distributed over at least 22 degrees of freedom. The rate of reaction is given by $k = 2.25 \times 10^{16} e^{-53,000/RT}$ sec.⁻¹ L. L. B.

Transition of cold into hot flame at low-temperature auto-ignition of butane. M. B. NEUMANN and P. M. TUTAKIN (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 127—130).—The auto-ignition at comparatively low temp. of mixtures of C_4H_{10} and O_2 or air resembles the behaviour of C_5H_{12} , and proceeds by the production of a cold flame, requiring time τ_1 , followed by an oxidation of the products of the cold flame and the production of a hot flame, requiring an additional time τ_2 ; the total induction period is $\tau_1 + \tau_2$. On addition of N_2 and NH_3 to $C_4H_{10}-O_2$, τ_1 decreases almost equally with increasing $[N_2]$ and $[NH_3]$ at 321—324°, so that aldehydes, which would combine with NH_3 , cannot take an active part in the development of chains in the formation of the cold flame. τ_2 increases with rise in temp. at 338—344° with $C_4H_{10} + N_2 + O_2$, and decreases with increase in pressure. Admixture of N_2 at 340° and 373—455 mm. extends the region of hot flame and reduces τ_2 . These results support the view that after the formation of the cold flame a chain reaction occurs, with chains breaking at the vessel walls, but the possibility of auto-heating as an additional factor in the explosion is not excluded. R. S. B.

Theory of liquids. VI. Rate of reactions in liquids. T. S. WHEELER (Proc. Indian Acad. Sci., 1936, 4, A, 291—297; cf. A., 1936, 271).—The theory, in conjunction with that of Bradley (cf.

A., 1935, 173), applied to uni- and bi-mol. reactions gives results in moderate agreement with experiment.

N. M. B.

Rate of exchange between chloride ion and chlorine in aqueous solution. F. A. LONG and A. R. OLSON (J. Amer. Chem. Soc., 1936, 58, 2214—2215).—When Cl_2 is passed into aq. NHAcPh containing radioactive Cl' the exchange occurs with great rapidity.

E. S. H.

Kinetics of the addition of hypochlorous acid to a double linking. I. Hypochlorous acid and crotonic acid. E. A. SCHILOV and N. P. KANIAEV (J. Phys. Chem. U.S.S.R., 1934, 5, 654—672).—For 0.003—0.05*M* solutions the rate is given by $dx/dt = k[\text{HOCl}]^2[\text{C}_4\text{H}_6\text{O}_2]$. Cl catalyses the reaction and renders it of the second order. The energy of activation (0—20°) is 7570 g.-cal.

CH. ABS. (e)

Kinetics of benzoic acid rearrangement. F. H. WESTHEIMER (J. Amer. Chem. Soc., 1936, 58, 2209—2214).—The rates of rearrangement of benzil (I) in solutions of KOH , $\text{Ba}(\text{OH})_2$, and PhOH-PhO^- and $\text{o-C}_6\text{H}_4\text{Cl-OH-C}_6\text{H}_4\text{Cl-O}^-$ buffers in 32% EtOH at 100° are determined. Reaction between (I) and OH^- is bimol. and rearrangement to benzoic acid is considered to occur through the ion $\text{COPh-CPh}(\text{OH})\cdot\text{O}^-$ (cf. Whitmore, A., 1932, 1016; Ingold, Ann. Reports, 1933, 30, 177). The hydrolysis consts. of PhO^- and $\text{o-C}_6\text{H}_4\text{Cl-O}^-$ in 32% EtOH at 100° are determined conductometrically.

H. B.

Quantitative kinetic analysis in the alkaline hydrolysis of pentenoic esters. E. SCHJANBERG (Ber., 1936, 69, [B], 2486—2491).—Study of the alkaline hydrolysis of binary mixtures from $\text{CH}_3\cdot\text{CH}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{CO}_2\text{Et}$, $\text{CHMe}\cdot\text{CH}\cdot\text{CH}_2\cdot\text{CO}_2\text{Et}$, and $\text{CHEt}\cdot\text{CH}\cdot\text{CO}_2\text{Et}$ shows that it is not always necessary to isolate both homogeneous components to determine the individual rates of hydrolysis (k_1 and k_2). If the total rate of hydrolysis of mixtures containing 10—50% of the most readily hydrolysed component is known, the % composition, k_1 , and k_2 can be calc. if $k_1:k_2$ is >10—15. Mixtures with about 20% are required if $k_1:k_2$ is <10—15. If the ratio is <2 the experimental error renders kinetic analysis inaccurate. If k_2 is known and $k_1:k_2$ is >2 it is possible to calculate k_1 and A for all mixtures containing >5—10% of the component with the greater rate of hydrolysis.

H. W.

Kinetic medium effects in the reaction between bromoacetate and thiosulphate ions. S. EAGLE and J. C. WARNER (J. Amer. Chem. Soc., 1936, 58, 2335—2337).—Published work is discussed (cf. A., 1936, 165).

E. S. H.

Velocity of bromination and racemisation of α -carboxyethyl alkyl sulphones. A. MELLANDER (Arkiv Kemi, Min., Geol., 1936, 12, A, No. 1, 6 pp.; cf. A., 1934, 1313).—The unimol. velocity coeffs. (10^3k) for the bromination of $\text{R}\cdot\text{SO}_2\cdot\text{CHMe}\cdot\text{CO}_2\text{H}$ with an excess of Br in $N\text{-HBr}$ at 25°, 35°, and 45° are, respectively, 0.139, 0.379, 0.841 for $\text{R} = \text{Me}$, and 0.241, 0.681, 1.58 min^{-1} for $\text{R} = \text{Et}$. The mean val. for the ratio of k in 0.5*N*- and $N\text{-HBr}$ is 1.25 and 1.23, respectively, and that of A in the Arrhenius equation is approx. 4000 in each case. The racemisation coeff.

for the active acids, $\text{R} = \text{Me}$ and Et , respectively, at 25° is 0.147 and 0.276 in $N\text{-HBr}$, and 0.215 and 0.383 in H_2O . The mean val. of k'/k for the two acids is 1.09 and 1.11, respectively, at 25°.

J. W. B.

Reaction mechanism in the bromination of α -carboxyethyl alkyl sulphones. A. MELLANDER (Arkiv Kemi, Min., Geol., 1936, 12, A, No. 5, 18 pp.).—The apparent reaction order of the bromination of $dl\text{-R}\cdot\text{SO}_2\cdot\text{CHMe}\cdot\text{CO}_2\text{H}$ (I) with Br-N-HBr at 25° when the initial $[\text{Br}]$ is very small is sesquimol., but the actual mechanism involves a reversible unimol.

reaction: normal (I) $\xrightarrow{k_1}$ reactive (I), followed by the bimol. reaction, reactive (I) + $\text{Br} \xrightarrow{k_2}$ $\text{Br-acid} + \text{HBr}$. The val. of k_1 is assumed to be the same as that of the racemisation coeff. (determined polarimetrically; cf. A., 1934, 1313) of l -(I), and an expression for the val. of the ratio k_3/k_2 (which cannot be separately evaluated) is deduced. When the initial $[\text{Br}]/[(\text{I})]$ is >0.05 the val. of k_3/k_2 is const. (230 and 240 for $\text{R} = \text{Me}$ and Et , respectively) and is independent of variations in either $[\text{Br}]$ or $[(\text{I})]$, but when the relative initial $[\text{Br}]$ is higher (0.1—0.2) the val. of k_3/k_2 falls rapidly as the reaction proceeds.

Detonation of explosives and relation between density and detonation velocity.—See B., 1936, 1181.

High-level detonation velocities.—See B., 1936, 1181.

Theory of detonation.—See B., 1936, 1182.

Heterogeneous reaction kinetics of the conversion of dibromosuccinic acid into monobromofumaric acid. B. TAMMAMUSHI and H. UMEZAWA (Bull. Chem. Soc. Japan, 1936, 11, 667—686).—The absorption coeffs. of $(\text{-CHBr}\cdot\text{CO}_2\text{H})_2$ (I) and $\text{CO}_2\text{H}\cdot\text{CH}\cdot\text{CBr}\cdot\text{CO}_2\text{H}$ (II) on SiO_2 gel are approx. the same and the reaction velocity relative to that in the homogeneous phase is unchanged. (I) is weakly adsorbed and (II) strongly adsorbed on sugar charcoal and on haemin-sugar charcoal, whilst the velocity of conversion is diminished. The energies of activation are given and the results are discussed in relation to Krut's orientation theory (A., 1929, 1399).

R. S.

Catalysis and catalysts in chemistry and biology. A. MITTASCH (Naturwiss., 1936, 24, 770—777, 785—790).—A lecture.

Genesis of catalysts. G. K. BORESKOV (J. Phys. Chem. U.S.S.R., 1935, 6, 255—262).—A review.

CH. ABS. (e)

Role of supersaturation in the production of catalysts. S. ROGINSKI (Acta Physicochim. U.R.S.S., 1936, 4, 729—756).—Systems which have not reached a min. of free energy are said to be "supersaturated." The energy relationships in the formation of new condensed phases are considered. Systems without structural supersaturation are usually of small catalytic activity. A theory of the occurrence of supersaturation in systems is based on the nuclear theory of crystal growth.

A. J. M.

Production of free radicals from ethylene oxide and the catalysis of other reactions by

them. C. J. M. FLETCHER and G. K. ROLLEFSON (J. Amer. Chem. Soc., 1936, 58, 2135—2140).— $(\text{CH}_3)_2\text{O}$ is converted into MeCHO when heated at 450° . Free radicals are formed simultaneously and decompose MeCHO by a chain mechanism, although they do not affect the above isomerisation. The rate of induced decomp. of MeCHO $\propto [(\text{CH}_3)_2\text{O}]^x$ and $[\text{MeCHO}]^x$, where x is slightly <1 ; it is retarded slightly by He, moderately by COMe_2 and MeOH, and considerably by NO; the corresponding energy of activation is $41,500 \pm 500$ g.-cal. The kinetics are explained by a chain decomp. initiated by free radicals, which disappear partly at ternary collisions and mainly in the gaseous phase. E. S. H.

Presence of free radicals in the thermal decomposition of diethyl ether. C. J. M. FLETCHER and G. K. ROLLEFSON (J. Amer. Chem. Soc., 1936, 58, 2129—2135).—Decomp. has been studied over the range 6—450 mm. and 473 — 562° . Analysis shows that aldehydes are always formed as intermediates and that their rates of decomp. are $>$ in the pure state. The decomp. of MeCHO is catalysed by small amounts of Et_2O , which is explained by the formation of free radicals from Et_2O and the initiation of a chain decomp. of the aldehyde. The mechanism is further discussed. E. S. H.

Effect of ozone on the spontaneous ignition phenomena of hexane. K. TAWADA (J. Soc. Chem. Ind. Japan, 1936, 39, 304B).—In presence of 0.03—0.91% of O_3 the ignition temp. was markedly lowered. A chain reaction is postulated. J. W.

Acid catalysis in sulphuric acid-acetic acid solutions. Rate of bromination of *m*-nitroacetophenone. M. A. PAUL and L. P. HAMNETT (J. Amer. Chem. Soc., 1936, 58, 2182—2187).—In AcOH the rate of reaction increases with increasing $[\text{H}_2\text{SO}_4]$ more rapidly than does the acidity function H_0 , the stoichiometric concn. of H_2SO_4 , or the activity of H_2SO_4 . E. S. H.

Mixed catalytic effects in the decomposition of hydrogen peroxide in presence of sodium tungstate and additional catalysts. M. BOBTELSKY and (NME.) L. BOBTELSKY-CHAJKIN (Compt. rend., 1936, 203, 872—874).—The catalytic decomp. of H_2O_2 has been studied in the presence of Na_2WO_4 together with Cu^{++} , Mn^{++} , Co^{++} , Ni^{++} , Fe^{+++} , SO_4^{--} , NO_3^- , F^- , Cl^- , Br^- , or I^- . The decomp. may follow either a normal (rapid) course, or an abnormal (slow) course, the latter, which occurs fortuitously, following a unimol. law and being least common in presence of strong catalysts, e.g., Cu^{++} or I^- . J. W. S.

Activating effect of poisons in electrocatalysis. N. I. KOBOSEV and V. V. MONBLANOVA (Acta Physicochim. U.R.S.S., 1936, 4, 395—408).—The effects of traces of HgCl_2 , As_2O_3 , and H_2S on the electrocatalytic reduction of $\text{C}_5\text{H}_5\text{N}$ to piperidine have been studied. HgCl_2 and As_2O_3 had an accelerating action which, however, was temporary in the case of As_2O_3 . With H_2S the results were indefinite, but in no case was a retarding effect noticed. C. R. H.

Hydrolysis of arylsulphuric acids. III. IV (a) Conjugation between the benzene nucleus and unsaturated side-chains; (b) Steric effects

and the influence of alkyl groups. G. N. BURKHARDT, C. HORREX, and D. I. JENKINS (J.C.S., 1936, 1649—1653, 1654—1660).—III. When catalysed by KHSO_4 , addition of K_2SO_4 reduces the velocity of hydrolysis, k , of KPhSO_4 , by suppressing the dissociation of HSO_4^- , and the negligible val. for k finally attained is in accord with the absence of catalytic activity from HSO_4^- and SO_4^{--} . Linear relationship exists between $\log k$ and $1/T$ in the case of *p*-nitro- and *p*-methyl-phenylsulphate. Further confirmation that k is increased by substituents in the aryl group which cause electron recession from the SO_4 group has been obtained. The high vals. for α in the expression $k = \alpha e^{-E/RT}$ are considered in relation to the influence of ionic charges. Substituents appear to affect k by altering the val. of E .

IV (a). Theories of *o*- and *p*-substitution in cinnamic derivatives and ω -nitrostyrene are discussed and considered in relation to the hydrolysis data. The influence of substituents on k , viz., *p*-CHO $>$ *p*-COMe $>$ *p*-CO₂H $>$ *p*-CH:CH-CO₂H $>$ *o*-CHO $>$ *m*-CHO $>$ *m*-CO₂H $>$ *m*-COMe $>$ *m*-CH:CH-CO₂H $>$ H $>$ *m*- and *p*-CH₂-CH₂-CO₂H $>$ *p*-Et, is interpreted. (b) *o*-Substituents containing two or more atoms, other than H, exhibit definite steric hindrance. With increasing size of the alkyl group in alkyl phenylsulphates, the electron-repulsive character decreases. With most of the aryl sulphates containing *o*-alkyl groups, steric influences outweigh the electron-repulsive effect. C. R. H.

Catalytic combination of hydrogen and oxygen at the surface of platinum. D. L. CHAPMAN and P. W. REYNOLDS (Proc. Roy. Soc., 1936, A, 156, 284—306).—An active Pt surface can be rendered inactive by reduction in H_2 and subsequent oxidation at 1000° . The activity can be restored by prolonged oxidation followed by pickling in HCl. Pt, like Ag, can be covered with a coating of difficultly reducible oxide, and evidence is adduced to show that this is the oxide of a base metal present as an impurity in the "pure" Pt. The passivity of Ag after it has been heated at a high temp. in O_2 is probably also caused by a similar impurity in the metal. The bearing of the results on the question of the thermionic emission from Pt filaments is discussed. L. L. B.

Mechanism of the oxidation of carbon monoxide on manganese dioxide. IV. Adsorption of carbon monoxide and dioxide at low pressures. F. CHARACHORIN and S. ELOVITZ (Acta Physicochim. U.R.S.S., 1936, 5, 325—354).—Mol. and activated adsorption of CO predominate at low and high temp., respectively, both types occurring between 200° and 300° abs. The surface $[\text{CO}] \propto$ the pressure, and the calc. heat of adsorption is const. for various pressures. A formula is derived which is in satisfactory agreement with the data; for cases where the surface $[\text{CO}]$ is considerable and the effect of surface inhomogeneity is negligible, it can be simplified to $dq/dt = k(q_0 - q)$, where t = time, k = const., and q_0 and q are measures of the original and final surface $[\text{CO}]$. The active adsorption of CO_2 at 25° was confirmed. C. R. H.

Role of the solid phase in the ignition of combustible mixtures. M. POLJAKOV and K. GRJAN-

ENKO (Compt. rend. Acad. Sci. U.R.S.S., 1936, 3, 315—317).—A Pt surface, introduced in the form of wire, and small relatively to the size of the reaction vessel, produces a decrease in the val. of the lower explosion limit in the system $\text{CH}_4 + \text{O}_2$ at $>750^\circ$. An increase in the Pt surface (greater length of wire) raises the limit, and when a uniform distribution of the Pt throughout the vessel is present, a large increase of the limit results at all temp. D. C. J.

Oxidation of phosphorus in presence of charcoal. V. N. OSIPOV (J. Gen. Chem. Russ., 1936, 6, 1096—1100).—Oxidation of white P in mixtures with damp charcoal at 18° proceeds smoothly, and involves a temp. rise to $>30^\circ$. The proportions of H_3PO_4 , $\text{H}_4\text{P}_2\text{O}_6$, H_3PO_3 , and H_3PO_2 in the product do not differ significantly from those found in absence of C. R. T.

Influence of added substances on the space-lattice and activity of chromium catalysts. I. E. ADADUROV and T. L. POMITSHEVA (J. Appl. Chem. Russ., 1936, 9, 1580—1587).— $\text{SnO}_2\text{--Cr}_2\text{O}_3$ catalysts of SO_2 oxidation owe their activity to the formation of a complex, $\text{SnO}_2 \cdot 12\text{Cr}_2\text{O}_3 \cdot 4\text{H}_2\text{O}$. The catalyst is stabilised by inclusion of about 3% of Sb_2O_3 . R. T.

Constancy of the difference in the heats of activation on dehydration of ethyl, *n*-propyl, and isobutyl alcohols on various catalysts. I. E. ADADUROV and P. J. KRAINI (J. Phys. Chem. U.S.S.R., 1934, 5, 1125—1131).—The heats of activation for dehydration on blue W oxide catalyst were: EtOH 18,900, PrOH 16,400, BuⁿOH 13,900, and BuⁱOH 7900 g.-cal., and on ThO₂ deposited on pumice were: EtOH 64,500 and BuⁿOH 59,500 g.-cal. (250—400°). The differences between the *E* vals. for EtOH and other alcohols were identical with those found by Dohse on bauxite (A., 1930, 431). CH. ABS. (e)

Recent theory of catalytic oxidation of gaseous substances at a sufficiently high temperature. S. HERZEN (Ing. chim., 1935, 19, 110—122).—A discussion. Heats of transformation of metallic oxides are tabulated. Oxides capable of oxidising at low temp., in an atm. rich in O₂, are those of low heat of transformation (especially Ag and Re). In an atm. of medium O₂ content, Mn and its group are suitable. In an atm. very low in O₂ the catalysts should be those of high heat of transformation, e.g., those of Cu, Ti, Te, and Bi. CH. ABS. (e)

Role of carriers in heterogeneous catalysis. P. KISELGOV (J. Phys. Chem. U.S.S.R., 1934, 5, 1470).—A criticism of Adadurov and Kraini's conclusions as to the relation between characteristic λ and the temp. of initial catalytic activity (cf. A., 1935, 1086). CH. ABS. (e)

Thermal decomposition of Na₂SO₄ in presence of kaolin. II. J. A. FIALKOV and S. D. SHARGORODSKI (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 437—457; cf. A., 1936, 1075).—Decomp. of Na₂SO₄-kaolin mixtures is accelerated by wood charcoal; e.g., in presence of 0.5 mol. of C per mol. of Na₂SO₄ at 1050° the same decomp. rate is attained as without C at 1200°. When 0.1—0.9 mol. of C

per mol. of Na₂SO₄ is used the reaction seems to be $2\text{Na}_2\text{SO}_4 + \text{C} = 2\text{Na}_2\text{O} + 2\text{SO}_2 + \text{CO}_2$; the resulting gases contain up to 18% SO₂. The solid residue is more easily decomposed by dil. H₂SO₄ than in absence of C. Addition of Ca salts was useless. J. J. B.

[Catalytic] hydrogenation of vegetable and animal oils at high pressures.—See B., 1936, 1165.

Nickel-kieselguhr and nickel borate catalysts in oil and fat hardening.—See B., 1936, 1165.

[Catalytic] polymerisation of ethylene under pressure.—See B., 1936, 1139.

Retarding effect of stannous salts on oxidation of olein and oils.—See B., 1936, 1165.

[Catalytic] production of synthetic acids under low pressure.—See B., 1936, 1191.

Relative efficiencies of the multistage and one-stage process in the electrolytic preparation of heavy water. V. T. CHIPLOMKAR (Proc. Indian Acad. Sci., 1936, 4, A, 463—467).—Calculation from Urey's equation indicates that, compared with a single-stage process, there will be no loss of efficiency in the multistage process if fresh H₂O be added continuously. A relation has been derived connecting the decrease in efficiency with the relative magnitude of the steps. J. W. S.

Electrolytic formation of persulphate. II. R. MATSUDA and T. NISHIMORI (Bull. Chem. Soc. Japan, 1936, 11, 650—659; cf. A., 1936, 436).—The current efficiency, *C.E.*, for the electrolysis of aq. (NH₄)₂SO₄ + H₂SO₄ is increased by previous ignition of the Pt anode. For a given sulphate concn., *C.E.* is greatest when H₂SO₄ is absent, and the omission of a diaphragm is without effect. *C.E.* relative to Caro's acid has been determined, and it is suggested that it depends on η of the solutions. The total *C.E.* decreases with time, whilst *C.E.* for Caro's acid attains a max. and then decreases. Elbs' theory is in accord with the results. R. S.

Black silver. A. GLAZUNOV and E. DRESCHER (Chem. Listy, 1936, 30, 260—264).—Ag is deposited in a black, non-metallic form by electrolysis of aq. or aq. ammoniacal AgNO₃, Ag₂SO₄, AgCl, or AgOAc, but not of AgCl in aq. KCN. The optimum [Ag⁺] is 0.1—1%, the necessary c.d. rising with the [Ag⁺]. The velocity of crystallisation curve has two breaks, corresponding with deposition of black Ag shortly after commencement of electrolysis, and with crystallisation of ordinary Ag at a time when the c.d. at the cathode falls below a certain limiting val., owing to increased cathode surface. R. T.

Electrolytic refining of silver containing palladium.—See B., 1936, 1211.

Formation and growth of pits in electro-deposited metals.—See B., 1936, 1211.

Electrolysis of aqueous solutions of sodium and zirconyl sulphates. H. B. LINFORD (Res. Stud. State Coll. Washington, 1936, 4, 53).—Experimental details are given for obtaining thin, bright, adherent, and compact deposits of Zr from an aq. bath containing Na₂SO₄ and ZrOSO₄. F. L. U.

Improved method for electrodepositing alloys.—See B., 1936, 1161.

Significance of the p_H value in alkaline baths for electrodeposition.—See B., 1936, 1161.

Electrolysis of magnesium methyl iodide in *n*-butyl ether.—See A., II, 10.

Capacity for reduction of the keto-group on graphite. V. SIHVONEN (Suomen Kem., 1936, 9, B, 26; cf. A., 1935, 714).—CO led into dil. H_2SO_4 at room temp. gave on a graphite electrode very little CH_2O on electrolysis, and CO_2 gave no CH_2O . No CH_2O was formed with a.c. between graphite electrodes in dil. H_2SO_4 , but with a.c. of low frequency CH_2O , MeOH, and org. acids are formed from the CO and CO_2H groups on the graphite, by alternate oxidation and reduction. The electrolytic O_2 was small, and no hydrocarbons or H_2O_2 were formed. R. S. B.

Chemical reactions in electric discharges. II. Formation of ammonia by collision with positive ions. I. MOTSCHAN, S. ROGINSKI, A. SCHECHTER, and P. THEODOROV (Acta Physicochim. U.R.S.S., 1936, 4, 757—766).—The synthesis of NH_3 in a discharge tube by collision with Li^+ , Na^+ , K^+ , Rb^+ , and Cs^+ has been investigated. A definite velocity of ions is required to start the reaction, the crit. potential being 22 ± 1 volts. 4—8 mols. of NH_3 are produced per ion. A. J. M.

Chemical reactions between nitrogen and oxygen in a high-frequency discharge. A. A. BALANDIN, J. T. EIDUS, and N. G. ZALOGIN (Acta Physicochim. U.R.S.S., 1936, 4, 365—394).—Under the influence of a high-frequency discharge, mixtures of N_2 and O_2 yield at first O_3 and N_2O_5 , the O_3 being subsequently decomposed. When the velocity of decomp. of O_3 has reached a max. val. N_2O_5 decomposes into NO_2 . The N_2O_5 is supposed to catalyse the decomp. of O_3 by decomposing into NO_2 and O_2 . The NO_2 reacts with O_3 to form NO_3 , which combines with NO_2 to re-form N_2O_5 . C. R. H.

Chemical effects of high-frequency electric discharge on a nitrogen-oxygen mixture. A. A. BALANDIN, J. T. EIDUS, and N. G. ZALOGIN (J. Phys. Chem. U.S.S.R., 1935, 6, 391—409; cf. preceding abstract).—The energy input for 1 kg. of HNO_3 is 39.6 kw.-hr., and the efficiency of the electric discharge is 0.028%. CH. ABS. (e)

Influence of some variables characterising the quenching of high-frequency waves in the oxidation of sulphur dioxide. N. NETSCHAIEVA (J. Phys. Chem. U.S.S.R., 1935, 6, 76—82).—Mixtures of air and SO_2 were subjected to a high-frequency electric discharge. The SO_2 oxidised \propto the applied voltage (8—32 kv.). The rate of oxidation increased somewhat with increase of the current. Oxidation was greater in narrow tubes and when the discharge was spread out. The SO_3 formed is a linear function of the ionisation. CH. ABS. (e)

Photochemical oxidation of hydrogen iodide. V. KONDRATEEV, E. KONDRATEVA, and A. LAURIS (J. Phys. Chem. U.S.S.R., 1934, 5, 1411—1423).—A linear relationship was established between the

fraction of the HI oxidised and the ratio $HI : O_2$. The reaction mechanism is discussed. CH. ABS. (e)

Factors influencing the decomposition of iodides by X-rays and γ -rays. H. Q. WOODARD (Amer. J. Roentgenol., 1935, 33, 227—234).—The decomp. of KI by X-rays and γ -rays depends on the p_H of the solution. Use of HNO_3 in place of H_2SO_4 or AcOH to establish a given p_H increases the amount of decomp. Formation of H_2O_2 is not an important factor. The I liberated by X-rays \propto the $[KI]$, but that liberated by γ -rays is the less the more conc. is the solution. The I liberated by X-rays or γ -rays from LiI, KI, or BaI_2 at approx. equinormal concns. in 0.05N- HNO_3 depends on the cation. CH. ABS. (e)

Photochemical decomposition of sulphur dioxide. M. KONSTANTINOVA-SCHLEZINGER (J. Phys. Chem. U.S.S.R., 1935, 6, 601—606).—The reaction $3SO_2 = S + 2SO_3$ was studied in a quartz vessel. In the dark the reverse reaction took place. On irradiation SO_3 also decomposes into SO_2 and O_2 . CH. ABS. (e)

Photochemical action of ultra-violet rays on Eder's solution. E. V. SCHPOLSKI and E. N. IVANOVA (J. Phys. Chem. U.S.S.R., 1935, 6, 133—141).—The reaction proceeds linearly with time and the rate \propto the square root of the light intensity. The rate increases with the $[(NH_4)_2C_2O_4]$, but becomes const. at 8×10^{-2} mol. per litre. CH. ABS. (e)

Discoloration of zinc sulphide in light. H. PLATZ and P. W. SCHENK (Angew. Chem., 1936, 49, 822—826).—The products of the photo-reaction leading to the discoloration of ZnS in the form of wurtzite (I), blende (II), and unignited pptd. ZnS (III) have been quantitatively evaluated. (I), in an atm. of H_2 , forms Zn^{++} , SO_4^{--} (in equiv. amounts), free Zn and S (also in equiv. amounts), and approx. 4 mols. of H_2 per atom of Zn^{++} . In presence of O_2 , Zn^{++} and SO_4^{--} are formed, 2 mols. of O_2 per atom of Zn^{++} being absorbed simultaneously; no discoloration then occurs. (II), as also (III) very slowly, is not discoloured, but forms Zn^{++} and SO_4^{--} with evolution of H_2 or absorption of O_2 according to conditions. The net reaction is thus $ZnS + 4H_2O = ZnSO_4 + 4H_2$; (I) alone gives also $ZnS = Zn + S$. The latter is regarded as the primary reaction in all cases, followed by $4S + 4H_2O = H_2SO_4 + 3H_2S$; $Zn + H_2SO_4 = ZnSO_4 + H_2$; $ZnSO_4 + H_2S = ZnS + H_2SO_4$. In support of this mechanism, irradiation in presence of aq. $CdSO_4$ leads to the pptn. of CdS. J. S. A.

Photochemical sensitivity of mercuric nitrate. (A) M. MUDROVČIĆ. (B) S. ŠLJIVIĆ and D. NIKOLIĆ (Bull. Soc. Chim. Yougoslav., 1936, 7, 41—43, 43—44).—Polemical. R. T.

Temperature coefficient of photographic sensitivity. II. Effect of low temperature on the photographic action of alpha-particles. S. E. SHEPARD, T. R. WILKINS, E. P. WIGHTMAN, and R. N. WOLFE (J. Franklin Inst., 1936, 222, 417—460; cf. A., 1934, 976).—Apparatus was constructed for the exposure of films at low temp. to a diffuse source of α -rays in close proximity. The Kinoshita equation does not apply in this case, either with a process or with a double-coated panchromatic emul-

sion. Two new, but similar, formulæ have been evolved, and the calc. vals. agree well with the results; for the double-coated emulsion, the results agreed well when equal thicknesses of the layers was assumed. At low temp. there was a loss of contrast and an apparent reciprocity failure; photomicrographs show that fewer grains develop and the rate of development is less in the early stages for exposures at low temp. Considerable "desensitising" effects were found when films given oxidation treatment followed by replacement of the sol. halides removed were exposed at low temp. The hypothesis of the immobility of freed Br atoms at low temp., and their action on the latent image as the temp. rises, is maintained. J. L.

Present position of the theory of the latent [photographic] image. J. EGGERT (Z. wiss. Phot., 1936, 35, 230—233).—A review is given, showing (1) that the exact energy relationships found for the effects of light on KBr crystals cannot be applied to Ag halides, or to the effects of sensitisers, (2) that the X-ray quantum acts indirectly by the release of a swarm of secondary electrons, and that the energy required for the separation of 1 mol. of Ag decreases with increasing λ (including visible and infra-red light), and (3) that whilst the reciprocity law holds for the action of α -particles on ordinary emulsions, it does not hold when Lippmann plates are employed. J. L.

General theory of the blackening curve of a photographic material. J. E. DE LANGHE (Physica, 1936, 3, 904—920; cf. B., 1935, 783).—Mathematical. The general theory of the blackening of a monodisperse single-grain layer emulsion by monochromatic light of any λ is developed on the hypothesis that photolytic Ag atoms come together in groups at the surface of the grain according to probability laws and form development nuclei.

O. D. S.

Theory of photographic development. III. Adsorption model of the latent image and its development. A. J. RABINOVITSCH and S. S. PEISSACHOVITSCH (Acta Physicochim. U.R.S.S., 1936, 4, 705—728).—A model of the process of photographic development is described in which the emulsion nuclei of AgBr are replaced by colloidal AgBr particles, and the Ag centres produced by exposure are replaced by colloidal Ag particles, which are added to the AgBr sol. Addition of alkaline quinol (I), adurol, p -OH·C₆H₄·NH₂, metol, amidol, or eikonogen causes a rapid blackening of the mixture corresponding with development of the latent image. The speed of blackening is different with each developer. Colloidal Pt, Au, and Cu may replace the colloidal Ag of the model, and the mixture will develop in the same way. No development, however, is possible if Bredig's Ag, Pd, Bi, Al(OH)₃, Fe(OH)₃, TiO₂, and C sols are used. All sols which may replace Ag in the model and give similar results will adsorb (I), whilst those which do not allow development to occur do not adsorb it. By cataphoresis and centrifuging experiments it is shown that the Ag particles are intimately bound to the AgBr particles. If gelatin is added to the AgBr sol before addition of Ag sol, no development occurs, showing that the intimate linking between Ag and AgBr is a

necessity for development. This is in agreement with the adsorption theory (B., 1934, 813; A., 1934, 1079). The effect of size of Ag particles on the development was examined. The effect of a reducing and an oxidising medium was investigated by passing H₂ and O₃, respectively, through the undeveloped mixture. Subsequent development with (I) was very rapid in the first case, showing that H₂ increases the reducing action of (I). In the case of O₃ no development was observed, the Ag having been oxidised. Na₂SO₃ slows down development. The effect of p_H , concn. of developer constituents, and excess of KBr was also investigated. A. J. M.

Additivity and subtractability of the action of light of different spectral regions. F. L. BURMISTROV (J. Tech. Phys. U.S.S.R., 1934, 4, 534—543).—The Herschel and Becquerel effects in many cases show the same relation of the latent image to the intensity of the preliminary and secondary exposures. The curves of density as a function of the intensity have one or two neutral points, corresponding with the overlap between the Herschel and Becquerel effects. CH. ABS. (e)

Photochemical reaction of chlorine with formic acid. H. L. WEST and G. K. ROLLEFSON (J. Amer. Chem. Soc., 1936, 58, 2140—2144).—The reactivities of single and double mols. are practically the same. Reaction is by a chain mechanism involving the formation of an intermediate, probably ClCO₂H. If excess of Cl₂ is present or the reaction vessel is heated to destroy residual intermediate, the products are CO₂ and HCl. A mechanism of reaction is put forward. E. S. H.

Kinetics of photochemical synthesis in solutions of formaldehyde in ultra-violet light. A. S. ACHMATOV and F. S. BARUISCHANSKAJA-LANDSBERG (J. Phys. Chem. U.S.S.R., 1935, 6, 83—91).—The amount of ppt. obtained by the interaction of aq. CH₂O with Benedict's solution in ultra-violet light was a linear function of the time of irradiation. No osazones of carbohydrates could be obtained. CH. ABS. (e)

Photo-reactions of liquid and dissolved ketones. III. E. J. BOWEN and A. T. HORTON (J.C.S., 1936, 1685—1688).—In n -C₆H₁₄ and cyclohexane solutions of COMe₂, after being subjected to radiation of 3135—2480 Å., dimethyl- n -hexyl- and cyclohexyldimethyl-carbinol, respectively, were detected, as were also Br-absorbing substances. The quantum efficiency of the reaction decreases with increasing [COMe₂]. C. R. H.

Primary photochemical processes. IX. Decomposition of nitromethane and nitroethane. E. HIRSCHLAFF and R. G. W. NORRISH (J.C.S., 1936, 1580—1585).—The primary stage in the photochemical decomp. of MeNO₂ and EtNO₂ is the formation of CH₂O and MeCHO, respectively, and the elimination of the NOH radical. Subsequent stages are attributed to the decomp. and oxidation products of NOH. In view of similar primary reactions occurring in the decomp. of NO-compounds, it is considered that during light absorption a NO-group must be present and that at some stage of mol.

vibration it is approached by a H atom, decomp. taking place according to $R\cdot CH_2\cdot N(O) \rightleftharpoons O \rightarrow R\cdot CH\cdot N(OH) \rightleftharpoons O \rightarrow R\cdot CHO + NOH$. C. R. H.

Role of molecular orientation in photochemical reactions in monolayers. J. S. MITCHELL (J. Chem. Physics, 1936, 4, 725—730).—The theory of the effect of mol. orientation in a monolayer on the general processes of light absorption and the quantum efficiency of photochemical reactions occurring in it is discussed. Direct measurement of the absorption spectrum of a monolayer is essential for the abs. determination of the quantum efficiency.

F. L. U.

Photochemistry of methylene-blue. K. M. BRANDT (Arkiv Kemi, Min., Geol., 1936, 12, B, No. 7, 5 pp.).—Buffered solutions of methylene-blue (I) in EtOH at p_H 8.6 undergo photochemical reduction to leuco-(I). An equilibrium is thereby set up which is strongly displaced in favour of leuco-(I) in presence of Fe^{II} salts. Fe^{II} or EtOH alone exerts some reducing action.

J. S. A.

Production of hydrogen peroxide in water by α -rays. C. E. NURNBERGER (J. Chem. Physics, 1936, 4, 697—702).—The ultra-violet absorption spectrum of air-free H_2O irradiated by α -rays reveals the presence of small amounts of H_2O_2 . The action is accompanied by the evolution of gas containing H_2 in excess of the proportion present in an electrolytic mixture.

F. L. U.

Theory of interaction of atom and metal. J. B. ZELDOVITSCH (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 22—27).

CH. ABS. (e)

Reactions in the solid state. I. Reactivity in the solid state. J. A. HEDVALL. **II. Course of reactions.** W. JANDER. **III. The active state which is passed through in reactions in which several solid substances take part.** G. F. HUTTIG (Angew. Chem., 1936, 49, 875—879, 879—882, 882—892).—I. A crit. review.

II. A review.

III. A summary of recent investigations of the heats of activation of solid reactions. J. W. S.

General characteristics of the volume change during reaction in solutions. I. I. SASLAVSKI (J. Phys. Chem. U.S.S.R., 1934, 5, 1440—1444).—A review.

CH. ABS. (e)

Heavy hydrogen as an indicator of the course of chemical reactions. T. H. JAMES (J. Chem. Educ., 1936, 13, 458—462).—A summary of recent work.

L. S. T.

Compound of cuprous chloride with phosphorus trichloride. T. L. DAVIS and P. EHRLICH (J. Amer. Chem. Soc., 1936, 58, 2151—2153).— $CuCl$ and PCl_3 combine directly to give the compound, $(CuCl)_2\cdot PCl_3$ (I), converted by $MeOH$ into the complex $CuCl\cdot P(OMe)_3$, m.p. 216—217° (lit. 190—192°), which on pyrolysis affords Cu , $MeCl$, and volatile P compounds. The dissociation pressures of (I) have been measured at 0—50°.

H. B.

Observations with the ultramicroscope on photo-sensitive crystals. III. Thermal processes in crystals. K. SCHAUM and A. BECKER (Z. wiss. Phot., 1936, 35, 241—267).—The thermo-

lysis of various crystals has been investigated with the ultramicroscope. The following processes occur: $AgNO_3 \rightarrow Ag + NO_2$; $Ag_2F \rightarrow Ag + AgF$; $KAu(CN)_4 \rightarrow Au + KCN + 1.5(CN)_2$ or $KAu(CN)_4 \rightarrow KAu(CN)_2 + (CN)_2$. The last decomp. takes place over a considerable temp. range, the crystal first becoming filled with ultramicros at about 200°. $CuBr_2$ does not break down to the metal, but gives $CuBr$. The colour change of anhyd. $KCNS$ on heating was studied. The blue melt (450°) contains colloidal S. The ultramicroscope reveals few particles at 450—600°, and their no. is not diminished on recrystallisation. Cryst. $KCNS$ shows no thermolysis.

A. J. M.

Double decomposition between solutions of magnesium sulphate and potassium carbonate in boiling solutions. (MME.) L. WALTER-LEVY (Compt. rend., 1936, 203, 879—881; cf. A., 1935, 1088).—Addition of 0.05 mol. of $MgSO_4$ to 2 litres of boiling aq. K_2CO_3 (1—3M) yields mainly $Mg(OH)_2$. Further addition of $MgSO_4$ yields $MgCO_3\cdot K_2CO_3\cdot 4H_2O$ (I) (in 2—5M solutions) or $5MgO\cdot 4CO_2\cdot 5H_2O$ (II) (in 0.1—2M solutions). When the reaction is prolonged (I) hydrolyses yielding $8MgO\cdot K_2O\cdot 6CO_2\cdot 6H_2O$. Addition of very small amounts of K_2CO_3 to very conc. aq. $MgSO_4$ yields $4MgO\cdot 2CO_2\cdot SO_3\cdot 7H_2O$ (III), whilst increased quantities of K_2CO_3 produce a mixture of (II) and (III). Addition of K_2CO_3 to dil. aq. $MgSO_4$ yields mainly (II) and $Mg(OH)_2$. Prolonging the reaction produces $6MgO\cdot SO_3\cdot 8H_2O$ (in conc. solution) or $Mg(OH)_2$ (in dil. solution). In no case was either $MgCO_3$ or $4MgO\cdot 3CO_2\cdot 3H_2O$ produced.

Mutual reactions of metals and salts. T. PECZALSKI (Physical Rev., 1936, [ii], 50, 785).—Below the m.p. of $CdCl_2$, Cu dissolves in the salt, which becomes reddish after heating for ~1 hr. Above the m.p. of $CdCl_2$, Cu dissolves rapidly in the melt, and, on cooling, the faces of the salt crystals are covered with a thin film of Cu—Cd alloy. The reaction is: $\alpha_1 Cu + \alpha_2 CdCl_2 \rightarrow \beta_1 CuCl + \beta_2 CuCl_2 + \beta_3 Cd$, and is endothermic. The concns. of reaction products increase with rise of temp., and the concn. of dissolved metals is greater in the liquid than in the solid $CdCl_2$; hence, on cooling, Cu is separated. Analogous phenomena occur for Cu heated in sublimed $NiCl_2$ and $CdCl_2$ vapours. Cu heated in $MgCl_2$ for 24 hr. at 640° contains 3 at.-% of Mg.

N. M. B.

Mechanism of precipitation processes. XVIII. Interaction between potassium ferrocyanide and alkaline-earth salts. Z. KARAOGLANOV (Z. anorg. Chem., 1936, 229, 313—320; cf. A., 1935, 1088).—The composition of the ppt. obtained by addition of aq. $K_4Fe(CN)_6$ to aq. $BaCl_2$, $CaCl_2$, and $SrCl_2$ has been determined, and the compounds $Ba_2Fe(CN)_6\cdot H_2O$ (I) and $6H_2O$; $BaK_2Fe(CN)_6\cdot 2H_2O$ (II), $3H_2O$, $4H_2O$; $Ba(NH_4)_2Fe(CN)_6\cdot 3H_2O$; $CaK_2Fe(CN)_6\cdot xH_2O$ (III); and $SrK_2Fe(CN)_6\cdot H_2O$ (IV) have been identified. The solubilities of (I), (II), (III), and (IV) are given.

R. S.

Orange modification of mercuric iodide. V. S. GORSKI (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 155—158).—When HgI_2 is recrystallised from $COMe_2$ at room temp. orange crystals up to 1 mm. in length accompany the red and yellow forms. They are

metastable between 15° and 140°, transforming into the red form below and into the yellow form above 126°. They belong to the symmetry class D_{4h} or C_{4v} (a 8.73, c 24.45 Å., 16 mols. of HgI₂ in the unit cell).

CH. ABS. (e)

Radium: discovery, properties, preparation, and uses. J. D. LEITCH (Canad. Chem. & Met., 1936, 20, 342—344).—A summary.

Reduction of boric anhydride by manganese. H. FORESTIER and (Mlle.) M. GRAFF (Compt. rend., 1936, 203, 1006—1007).— B_2O_3 or $Na_2B_4O_7$ and Mn, at temp. $>900^\circ$, give strongly ferromagnetic MnB. The Curie point of MnB is at 300°.

A. J. E. W.

Extraction of europium from monazite residues and the preparation of pure europium compounds. H. N. MCCOY (J. Amer. Chem. Soc., 1936, 58, 2279—2281).— $EuCl_3$ is reduced by Zn to $EuCl_2$ and subsequently separated as insol. $EuSO_4$. Pure Eu compounds have been prepared by several repetitions of the process.

E. S. H.

Activation of charcoal by superheated steam.

I. Time and temperature of activation. T. Y. CHANG, C. WU, and C. C. LIU (J. Chinese Chem. Soc., 1936, 4, 370—379).—Charcoals having good gas-absorbing and decolorising powers were produced by activation at 800—900° for 0.5—1 hr. with the steam in slight excess. Analysis of the gaseous products of activation forms the basis of a discussion of the mechanism.

D. C. J.

Primary reactions of the combustion of carbon.—See B., 1936, 1187.

Fundamental principles underlying the chemical corrosion of glass.—See B., 1936, 1152.

Chlorosulphonate-chlorides of titanium. G. P. LUTSCHINSKI (J. Gen. Chem. Russ., 1936, 6, 1108—1111).—The following reactions have been established: at 300° $TiO_2 + 2Cl_2 + 2SO_2 \rightarrow TiCl_4 + 2SO_3 \rightleftharpoons$ (400°) $TiCl_2(SO_3Cl)_2$ (I); $TiCl_4 + 3SO_2 \rightleftharpoons$ (400°) $TiCl(SO_3Cl)_2$; (I) + $2H_2O \rightarrow TiCl_2SO_4$ (II) + H_2SO_4 + $2HCl$; (II) + $H_2SO_4 \rightarrow Ti(SO_4)_2 + 2HCl$.

R. T.

Stability of dilute solutions of sodium hexametaphosphate.—See B., 1936, 1206.

Constitution of hydrated alkali niobates. P. SUE (Compt. rend., 1936, 203, 1001—1004).—13 known niobates of Li, Na, K, Rb, and Cs can be formulated as $M_yH_x[(NbO_3)_2(OH)_6]$, where M is the alkali metal, and $x + y = 18$.

A. J. E. W.

Bismuthihexanitrides. A. FERRARI and Z. CICCIOLO (Gazzetta, 1936, 66, 581—590).—The X-ray examination of bismuthihexanitrides of type $X_2Y[Bi(NO_2)_2]$ (where Y may = X) shows that these are closely analogous to the cobaltinitrides; the unit cell contains 4 mols. The formulæ $CsBi(NO_2)_6$, $Bi(NO_2)_3$ and $Tl_3Bi(NO_2)_6 \cdot TiNO_2 \cdot H_2O$ (J.C.S., 1913, 103, 2110) are incompatible with the crystal structure, as are those in which H_2O is structurally combined. The following are prepared from $Bi(NO_3)_3$ and single or mixed nitrites (where necessary in stages, or by double decomp.): K_3 , Rb_3 , Cs_3 , Tl_3 , K_2Li , Rb_2Li , Cs_2Li , $(NH_4)_2Li$, Tl_2Li , K_2Na , Rb_2Na , Cs_2Na , $(NH_4)_2Na$, Tl_2Na , K_2Ag , Rb_2Ag , Cs_2Ag ,

Rb_2Ag , Cs_2Ag , $(NH_4)_2Ag$, and Tl_2Ag , bismuthihexanitrides. X-Ray data for all are tabulated.

E. W. W.

Heavy oxygen content of carbohydrates. N. MORITA and T. TITANI (Bull. Chem. Soc. Japan, 1936, 11, 695—697).—The d of H_2O obtained by combustion of glucose, cotton-wool, and cedar wood is $>$ that of ordinary H_2O owing to the presence of ^{18}O .

R. S.

Sulphur monoxide. VI. Formation of sulphur monoxide in some thermal decomposition reactions. P. W. SCHENK and H. TRIEBEL (Z. anorg. Chem., 1936, 229, 305—312; cf. A., 1935, 593).— $SOCl_2$ and $SOBr_2$ dissociate at $900 \pm 10^\circ$ and $520 \pm 10^\circ$, respectively, giving SO , which is also formed when $SOBr_2$ is heated in presence of Na, Sn, Mg, and Al. Ag is ineffective. The thermal decomp. of SO_2 in presence of S yields SO , which has been determined spectroscopically and by production of S on evaporation.

R. S.

Formation of intermediate products in the oxidation of sulphur dioxide solutions by ozone. L. I. KASCHTANOV and O. N. OLESCHTSCHUK (J. Gen. Chem. Russ., 1936, 6, 1112—1115).— $H_2S_2O_8$ (traces) and H_2SO_5 are formed as intermediate products in the reaction between aq. SO_2 and O_3 . The yields of $H_2SO_5 \propto 1/[SO_2]$, and, up to certain limiting $[O_3]$, increasing with the $[SO_2]$, are $\propto [O_3]$.

R. T.

Formation and constitution of sulphur nitride and so-called hexasulphamide. M. H. M. ARNOLD, J. A. C. HUGILL, and J. M. HUTSON (J.C.S., 1936, 1645—1649).—On the basis of the reactions of S_4N_4 , the annexed structure is proposed. For its prep., SCl as starting material and a high reaction temp. are recommended. The mol. wt. of hexasulphamide agrees with $S_{18}N_6H_{12}$, and a tentative formula, containing two broken S_8 rings, is suggested assuming $x = 5$. The colours formed by atm. oxidation of both compounds in presence of alkali have been investigated.

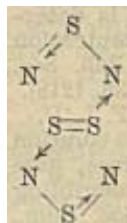
C. R. H.

Dissolution of "vacuum films" of metals in acids. I. Dissolution of chromium in sulphuric acid. M. A. ROSENBERG, K. E. AVAILIANI, and F. B. JURKOVSKAJA (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 135—139).—The dissolution of vac.-sublimed films of Cr, 15—56.5 μ thick, has been studied at 16° in 0.5 and 2N- H_2SO_4 by measuring the pressure; 0.001N- H_2SO_4 did not dissolve the films. The admission of 1—2 mm. (measured on the oil gauge) of O_2 to the film for 5—10 min. caused passivity which could not be removed by heating at 77°. Compact Cr did not dissolve under the same conditions.

R. S. B.

Precipitation and dehydration of chromic hydroxide. H. W. KOHLSCHUTTER [with O. MELCHIOR] (Angew. Chem., 1936, 55, 865—872).—Investigations of sedimentation vol., dissolution in acids, absorption of light, dehydration, and sintering establish a difference in mol. structure of $Cr(OH)_3$, pptd. from neutral and basic solutions, respectively, which is related to the difference of structure between neutral and basic sol. Cr salts.

E. S. H.



Formation of chromium carbides. R. TESTUT (Compt. rend., 1936, 203, 1007—1009).—Cr and C above 1700° give Cr_3C_2 , insol. in conc. HCl. Below 1500°, Cr_5C_2 is formed; this is sol. in conc. HCl. CO reacts with Cr below 1500°, producing Cr_5C_3 and Cr_7O_3 .
A. J. E. W.

Formation of molybdenum oxides Mo_3O_8 and Mo_2O_5 . E. CARRIÈRE and R. LAUTÉ (Compt. rend., 1936, 203, 791—792).— $\text{K}_6\text{Mo}_7\text{O}_{24}$ is reduced by $0.4\text{N-HI} + \text{HCl}$ to salts of Mo_3O_8 and by $1.5\text{N-HI} + \text{HCl}$ to salts of Mo_2O_5 . Hydrated Mo_2O_5 separates on adding K_2CO_3 to the acid solution of either Mo_3O_8 or Mo_2O_5 . The former is a combination of MoO_3 and Mo_2O_5 . Anhyd. Mo_2O_5 is formed by heating the hydrated oxide in N_2 at 250°. It is transformed into MoCl_5 by HCl at 200°. H. J. E.

Attack of molybdenum by alkaline potassium ferricyanide solutions. J. A. M. VAN LIEMPT (Rec. trav. chim., 1936, 55, 989—990).—Max. attack is given by a solution containing $\text{K}_3\text{Fe}(\text{CN})_6$ (360 g.), NaOH (36 g.), and H_2O (1 litre), which is suitable for metallographic etching.
E. S. H.

Chlorine nitrate. M. J. USCHAROV and V. O. TCHISTOV (Bull. Soc. chim., 1936, [v], 3, 2142—2143; cf. A., 1935, 857).—By the action of Cl_2 on AgNO_3 in dry $\text{C}_5\text{H}_5\text{N} + \text{CHCl}_3$, a white cryst. compound, $\text{ClNO}_3 \cdot 2\text{C}_5\text{H}_5\text{N}$ (I), m.p. 77—78° (decomp.), is obtained. (I) is sol. in H_2O , $\text{C}_6\text{H}_5\text{N}$, and CHCl_3 , but insol. in light petroleum. Perfectly dry conditions are essential to the prep.
F. L. U.

The Evans effect with impure iron is determined by humidity and by the concentration of the salt solution. P. RONCERAY (Bull. Soc. chim., 1936, [v], 3, 2077—2084; cf. A., 1936, 1218).
F. L. U.

Drops of concentrated copper sulphate solution on impure iron, polished and dust-free, give rise to "halo," "film," and an effect resembling that of Evans. P. RONCERAY (Bull. Soc. chim., 1936, [v], 3, 2084—2087; cf. A., 1936, 1216).—The phenomena are described and explanations are offered.
F. L. U.

In free air, corrosion of iron by drops of copper sulphate solution is determined by three mechanisms: local element, salt concentration cell, and circular Cu-Fe element. P. RONCERAY (Bull. Soc. chim., 1936, [v], 3, 2088—2092).—Further discussion of phenomena previously described (A., 1936, 1216).
F. L. U.

Inhibition of etching of iron in acid solution. G. LEJEUNE and P. A. JACQUET (Bull. Soc. chim., 1936, [v], 3, 2137—2142; cf. A., 1935, 294).—Dissolution of Fe (Armco) in 20% aq. H_2SO_4 is retarded by the presence of 0.5% of gelatin (I) by 30% at 25°, 60% at 50°, and 80% at 80°. The over-potential of H_2 at an Fe cathode is raised by addition of (I), and increasingly so as the c.d. rises. The inhibiting effect of (I) is considered to be due in part to the adsorbed layer hindering the diffusion of H^+ towards and of Fe^{2+} away from the Fe, and in part to the increase of H_2 over-potential, a view which is supported by the observed temp. relations.
F. L. U.

Mechanism of the action of nitrogen on steels. A. SCHECHTER (Acta Physicochim. U.R.S.S., 1936, 4, 767—774).—The thermodynamics and kinetics of the reactions $\text{N}_2 + 8\text{Fe} \rightarrow 2\text{Fe}_4\text{N}$ and $8\text{Fe} + 2\text{NH}_3 \rightarrow 2\text{Fe}_4\text{N} + 3\text{H}_2$ are considered. The effect of at. N (concn. approx. 10%) on steel was examined, and the hardness and structure of the outer layers were investigated. No marked formation of nitride was observed even after 12 hr. treatment at 550°, although NH_3 , under the same conditions, gives a normal nitride layer. It is concluded that the following reactions occur with at. N: $\text{N} + \text{Fe} \cdot \text{N} = 4\text{Fe} + \text{N}_2$; $\text{N} + \text{N} = \text{N}_2$.
A. J. M.

Cobaltammines which co-ordinate with quaternary ammonium bases. Y. NAKATSUKA (Bull. Chem. Soc. Japan, 1936, 11, 629—642).—The absorption spectra, viscosity, and f.p. depression of $[\text{Co}(\text{NH}_3)_{5-x}(\text{H}_2\text{O})_{1+x}]\text{X}_3\text{N-R}_4\cdot\text{OH}$ mixtures ($x = 1$ or 2, $\text{X} = \text{Cl}$ or 0.5SO_4 , $\text{NR}_4 = \text{NH}_4$, NMe_4 , or $\cdot\text{CH}_2\text{-NH}_3\cdot\text{OH}$) have been determined. Hydroxo-salts are not formed, but the presence of compounds of the type $[\text{Co}(\text{NH}_3)_{5-x}(\text{NR}_4\text{OH})_{1+x}]\text{X}_3$ is inferred.
R. S.

Werner complexes. Transformations of *cis*- $[\text{Co en}_2\text{Cl}_2]\text{Cl}$ and *cis*- $[\text{Co en}_2\text{Cl}(\text{H}_2\text{O})]\text{Cl}_2$ in aqueous solution. J. P. MATHIEU (Bull. Soc. chim., 1936, [v], 3, 2121—2136).—Hydration of *cis*- $[\text{Co en}_2\text{Cl}_2]\text{Cl}$ is effected in two stages, the first giving rise to *cis*- $[\text{Co en}_2\text{Cl}(\text{H}_2\text{O})]\text{Cl}_2$ by a reaction which is irreversible and little affected in acid solution by p_{H} , concn., or ionic strength, whilst the second yields $[\text{Co en}_2(\text{H}_2\text{O})_2]\text{Cl}_3$ by a reversible change the velocity of which depends on temp., concn., and p_{H} .
F. L. U.

Werner complexes. Structure and reactivity of chlorinated compounds. J. P. MATHIEU (Bull. Soc. chim., 1936, [v], 3, 2152—2154; cf. preceding abstract).—In the reaction $[\text{Co en}_2\text{Cl}_2]\text{Cl}$ (I) + $\text{H}_2\text{O} \rightarrow [\text{Co en}_2\text{Cl}(\text{H}_2\text{O})]\text{Cl}_2$ (II) the energy of activation of *cis*-(I) is < for *trans*-(I). The product (II) has always a *cis*-configuration. The reasons for this are discussed.
F. L. U.

Stereochemistry of complex inorganic compounds. II. Reaction of carbonates with dichlorodiethylenediaminocobaltic chloride. J. C. BAILAR, jun., F. G. JONELIS, and E. H. HUFFMAN. III. Reaction of ammonia with *l*-dichlorodiethylenediaminocobaltic chloride. J. C. BAILAR, jun., J. H. HASLAM, and E. M. JONES (J. Amer. Chem. Soc., 1936, 58, 2224—2226, 2226—2227; cf. A., 1934, 617).—II. *l*- $[\text{Co en}_2\text{Cl}_2]\text{Cl}$ reacts with a limited amount of Ag_2CO_3 to give *d*- $[\text{Co en}_2\text{CO}_3]\text{Cl}$, but larger amounts of Ag_2CO_3 give *l*- $[\text{Co en}_2\text{CO}_3]\text{Cl}$. Reaction with K_2CO_3 gives the *d*-salt independently of concn. A large excess of Ag_2CO_3 behaves similarly to K_2CO_3 . Temp. is not an important factor determining inversion.

III. A Walden inversion occurs in the reaction of *l*- $[\text{Co en}_2\text{Cl}_2]\text{Cl}$ with NH_3 , the rotatory power of the $[\text{Co en}_2(\text{NH}_3)_2]\text{Cl}_2$ being determined by the temp. of reaction. At < 25° the *d*-salt is formed.
E. S. H.

Preparation and properties of cobalt nitrosyl carbonyl and of cobalt carbonyl hydride. G. W.

COLEMAN and A. A. BLANCHARD (J. Amer. Chem. Soc., 1936, 58, 2160—2163).—The prep. of Co(NO)(CO) , (I) and HCo(CO)_4 (II) (m.p. -33°) is described. Br reacts quantitatively with (I), yielding CoBr_2 , NO, and CO. The absorption of CO by alkaline Co^{++} solutions is promoted by the presence of cysteine, tartrate, NH_2 -acids, CN' , and S'' . The acid strength of (II) is $>$ that of H_2CO_3 . (II) decomposes at room temp. into Co(CO)_4 and H_2 . E. S. H.

Complex metal-ammonium selenites and selenito-metalamines. P. RAY and A. N. GHOSH (J. Indian Chem. Soc., 1936, 13, 494—501).—The prep. of the following compounds [$\text{en} = (\text{CH}_2\text{NH}_2)_2$] is described:

$\text{SeO}_3[\text{Co en}_3]\text{HCO}_3 \cdot 2\text{H}_2\text{O}$; $[\text{Co en}_3]_2(\text{SeO}_3)_3 \cdot 4\text{H}_2\text{O}$;
 $\text{Cl}[\text{Co en}_3(\text{H}_2\text{O})_2]\text{SeO}_3 \cdot 0.5\text{H}_2\text{O}$;
 $[\text{Co en}_2(\text{H}_2\text{O})\text{SeO}_3]\text{Cl} \cdot 2.5\text{H}_2\text{O}$;
 $[\text{Co en}_2(\text{H}_2\text{O})\text{SeO}_3]\text{NO}_3 \cdot 2\text{H}_2\text{O}$;
 $[\text{Co en}_2\text{SeO}_3(\text{H}_2\text{O})]\text{Br}$; $[\text{Co en}_2(\text{H}_2\text{O})\text{SeO}_3]_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$;
 $[\text{Ni en}_3]\text{SeO}_3$; $[\text{Ni en}_2]\text{SeO}_3 \cdot 1.5\text{H}_2\text{O}$; $[\text{Ni}(\text{NH}_3)_6]\text{SeO}_3$;
 $[\text{Cu en}_2]\text{SeO}_3$; $[\text{Cu}(\text{NH}_3)_4]\text{SeO}_3$. C. R. H.

Reactions of nickel carbonyl with oxides of nitrogen. J. C. W. FRAZER and W. E. TROUT, jun. (J. Amer. Chem. Soc., 1936, 58, 2201—2204).—The temp. at which reaction between Ni(CO)_4 and N oxides is first detected are: $\text{NO}_2 -78^\circ$, $\text{N}_2\text{O}_3 -78^\circ$, $\text{NO} -11^\circ$, $\text{N}_2\text{O} >$ room temp. NO_2 at -78° gives a mixture of $\text{Ni(NO}_2)_2$ and $\text{Ni(NO}_3)_2$. N_2O_3 gives a solid product of unknown composition. NO liberates CO and traces of CO_2 from Ni(CO)_4 and gives solids of varying composition. NH_3 and NO give the compounds $[\text{Ni}(\text{NH}_3)_5\text{NO}]\text{NO}_2$ and $[\text{Ni}(\text{NH}_3)_5\text{NO}]\text{NO}$. NH_3 does not react with Ni(CO)_4 . E. S. H.

Spectrographic analysis.—See B., 1936, 1135.

Use of Raman effect in analytical chemistry. J. GOUBEAU (Z. anal. Chem., 1936, 107, 199; cf. A., 1936, 949).—Acknowledgment is made for the methods of purification advanced. J. S. A.

Electro-drop analysis procedure. H. FRITZ (Mikrochem., 1936, 21, 47—56; cf. A., 1935, 1473).—The reagent is absorbed on paper, which is placed on Al foil. The metal to be tested is connected either directly or through a source of potential with the Al (Al negative). The point of the metal is drawn over the paper, when a streak of colour indicates the presence of the metal sought for, and the rapidity of its formation and its intensity indicate the amount present. Use of a.c. permits the simultaneous test of two samples with the same or different reagents. J. W. S.

Systematic semi-micro-procedure for the qualitative analysis of the commoner cations. J. H. WINKLEY, L. K. YANOWSKI, and W. A. HYNES (Mikrochem., 1936, 21, 102—115). J. W. S.

Foaming analysis. A. SIEHR (Kolloid-Z., 1936, 77, 251—252).—Cf. A., 1936, 1080. E. S. H.

Organic reagents in inorganic analysis. F. FEIGL (Ind. Eng. Chem. [Anal.], 1936, 8, 401—410).—A crit. review. E. S. H.

Reference solution for the determination of acidity in very dilute solution. Y. KAUKO and A. K. AIROLA (Suomen Kem., 1936, 9, B, 27).—The

p.d. has been determined at 25° between two solutions of $10^{-4}N\text{-NaHCO}_3$ through one of which pure CO_2 , and through the other a mixture of CO_2 and air ($S\%$ of CO_2), was led. If $[\text{H}^-]$ refers to the former solution, $\log_e (1 + [\text{H}^-]/[\text{Na}^+]) = \log_e 100/S + FE/RT$. With $S = 0.1960 \pm 0.0005\%$, $E = 147.2 \pm 0.1$ mv. This gives for 25° $\log [\text{H}^-] = -4.178$ and $\log (\text{activity}) = -4.187$. The p_{H} of Veibel's solution has been determined, using this reference solution, to be 2.077 at 25° , after allowing for diffusion p.d.

R. S. B.

Two universal indicators. J. V. DUBSKY and A. LANGER (Z. anal. Chem., 1936, 107, 187—191).—Formulae are given for two universal indicators, to cover the full p_{H} scale 0—14, and giving a full colour scale over the p_{H} ranges 0—7 and 7—13, respectively. J. S. A.

Use of certain naphthols as fluorescent indicators. M. DERIBÈRE (Ann. Chim. Analvt., 1936, [iii], 18, 289—290).—The use and ranges of utility of several 3-CO-NHR-substituted β -naphthols ($R = \text{Ph}$, $\text{C}_6\text{H}_4\text{-NO}_2$, C_{10}H_7 , etc.) are described.

F. C. B. M.

Colorimetric determination with the aid of the Lange-Roth photometer. I. E. B. HATZ (Mikrochem., 1936, 21, 38—46).—The trustworthiness of the Lange-Roth photometer for the colorimetric determination of PO_4^{4-} , Fe^{+++} , uric acid, and cholesterol, and for p_{H} determinations with $\text{OH}\cdot\text{C}_6\text{H}_3(\text{NO}_2)_2$ and p - and m - $\text{OH}\cdot\text{C}_6\text{H}_4\text{-NO}_2$, has been ascertained.

J. W. S.

Oxidation-reduction indicators. II. Diphenylaminedicarboxylic acids. A. V. KIRSANOV and V. P. TCHERKASSOV (Bull. Soc. chim., 1936, [v], 3, 2037—2039; cf. A., 1936, 813).—2:2', 2:3', and 2:4'-Diphenylaminedicarboxylic acid, m.p. 289° (corr.), 276° (corr.), and 275° (corr.), respectively, can be used in 10—20*N*- H_2SO_4 , but not in HCl. A standard method of testing indicators is proposed. H. W.

Volumetric determination of moisture. N. C. MITRA and K. VENKATARAMAN (Current Sci., 1936, 5, 199—200).—The distilled H_2O is collected in a 3:1 mixture of $\text{C}_6\text{H}_5\text{N}$ and Ac_2O . The excess of the latter is converted into AcOH and NH_2Ac and titrated with alkali. C. W. G.

Determination of free chlorine in water using dimethyl-*p*-phenylenediamine. L. W. HAASE and G. GAD (Z. anal. Chem., 1936, 107, 1—8).—Disadvantages of the colorimetric method, using *o*-tolidine, for H_2O containing Fe are overcome by using $p\text{-NH}_2\cdot\text{C}_6\text{H}_4\cdot\text{NMe}_2$ (I). An acidified 0.00115% aq. solution of Me-red may be used as a comparison. A solution of (I) hydrochloride in 250 c.c. of 84% $\text{H}_3\text{PO}_4 + 150$ c.c. of 10% $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ is used. In presence of >1 mg. of Fe_2O_3 per litre, Cl may be converted into NH_2Cl , and Fe then removed by CaCO_3 . <5 mg. per litre of NO_2' does not interfere. Larger amounts may be removed with NaN_3 . J. S. A.

Silver chromate in a gelatin sol as a "spot" test reagent. F. G. LENNOX (J. Proc. Austral. Chem. Inst., 1936, 3, 313—318).—The distribution of Cl' (e.g., on the surface of wood, contaminated fabric, etc.) may be demonstrated by spotting with a reagent

prepared by slowly adding 9 vols. of 0.1*N*-AgNO₃ to 10 vols. of 0.1*N*-K₂CrO₄ in 1% aq. gelatin, and stirring continuously. Cl' decolorises the Ag₂CrO₄ and leaves a permanent stain on drying, 0.6 g. of Cl' being detectable using a drop 1 mm. in diameter. Comparison of the rates of reaction using standards enables approx. quant. results to be obtained. Br', I', S'', S₂O₃'', CNS', CN', Fe(CN)₆'', and Fe(CN)₆'''' are also detectable by the method if the distinguishing tests described are applied to the "converted" drop. Metallic surfaces containing Mg, Zn, Fe, or Pb produce blackening on drying, probably as a result of reduction. J. G.

Determination of bromides in presence of other halides. F. W. EDWARDS, H. R. NANJL, and E. B. PARKES (Analyst, 1936, 61, 743—749).—The mixed halides are treated with 2 ml. of *N*-KMnO₄ and dil. H₃PO₄, and the liberated Br is aspirated through a cold solution of KI, the equiv. amount of I liberated being titrated with standard Na₂S₂O₃ (cf. Behr *et al.*, A., 1930, 1486). If the concn. of H₃PO₄ and KMnO₄, the vol. of reaction mixture, and especially the rate and duration of aspiration are closely controlled, 10—100 mg. of Br' (as KBr) may be determined rapidly with a max. recorded error of +1.5 mg. in presence of >1 g. of KCl; the method is suitable for the evaluation of pharmaceutical KBr, except in presence of large quantities of Cl'. If an excess (9 ml.) of *N*-KMnO₄ is used, I' is completely and selectively oxidised to IO₃', and may be determined in the residue after aspiration by removing the excess of KMnO₄ with Na₂O₂, and liberating the I with KI and HCl; Cl is then determined by difference. The max. recorded error for 10—100 mg. of KBr in the presence of 50 mg. each of KCl and KI is 0.1 mg. J. G.

Determination of (A) iodine and bromine, (B) sodium and potassium, in mineral and drinking waters. S. MIHOIĆ (Cas. Vod. Plin. Sanit. Tehn., 1936, 2, 191—192, 231—232).—(A) The methods of Fresenius for I', and of Bunsen for Br' (substituting 0.1*N*-NH₂Cl for Cl₂-H₂O), are preferred.

(B) The filtrate obtained after separation of Fe, Al, Ca, Mg, and SiO₂ is evaporated to dryness, and the residue is ignited and dissolved in H₂O. K is determined as KClO₄, and Na as Na Mg uranyl acetate. R. T.

Determination of iodine and bromine in presence of each other. L. SPITZER (Ind. Eng. Chem. [Anal.], 1936, 8, 465—466).—Addition of HCO₂Na to an aliquot part of the aq. solution of I and Br converts Br into NaBr, but leaves I unchanged; I is then titrated with standard Na₂S₂O₃. KI is then added to a second aliquot portion of the solution and the total I determined by titrating with Na₂S₂O₃. Br is calc. by difference. To determine I' in presence of Br', Br is added to the solution, the excess removed by adding aq. HCO₂Na, and the liberated I titrated with Na₂S₂O₃. E. S. H.

Hydrochemical analysis. II. Determination of oxygen dissolved in water.—See B., 1936, 1238.

Preparation and keeping qualities of 0.1*N*-sodium thiosulphate. P. HORKHEIMER (Pharm.

Ztg., 1936, 81, 1184—1185).—0.1*N*-Na₂S₂O₃ solutions without any preservative additions are stable if made up in "aged" distilled H₂O, >6 months old. Changes of titre within 3 months are not likely in solutions, protected from light, which remain non-turbid. J. S. A.

Determination of degree of fineness of X-ray "contrast substances" [barium sulphate]. P. W. DANCKWORTT (Arch. Pharm., 1936, 274, 485—490).—The degree of fineness of various grades of BaSO₄ is determined by sedimentation analysis, to which Stokes' and Andreas' equations are applied. R. S. C.

Co-precipitation of ferric sulphate with barium sulphate and means for preventing it. A. GIACALONE and F. RUSSO (Gazzetta, 1936, 66, 631—638).—The pptn. of Fe₂(SO₄)₃ together with BaSO₄ from solutions of BaCl₂ containing FeCl₃ can be expressed by $y = Kx^{1/n}$, where y = mg. Fe₂(SO₄)₃ pptd. per g. BaSO₄, and x = concn. of FeCl₃ in the original solution. For $n = 2$ the val. of K is const. up to 4% FeCl₃. By adding a small excess of NH₄CNS (concn. 1.5%) and warming until the red colour disappears, when the Fe^{III} salt is reduced to Fe^{II}, a practically pure BaSO₄ ppt. is obtained on the addition of H₂SO₄, if the concn. of FeCl₃ is >1%. O. J. W.

Direct titration of sulphate with barium chloride using sodium rhodizonate as external indicator. II. A. MUTSCHIN and R. POLLAK (Z. anal. Chem., 1936, 107, 18—26; cf. A., 1936, 1478).—SO₃'' does not interfere if CH₂O be first added. S'' in fresh solutions does not interfere, but oxidation gives rise to errors which are avoided by adding glycerol. Titration is not possible in presence of S₂O₃'', which may, however, be converted by I into S₄O₆'', which does not interfere. High vals. are obtained in presence of NO₃', but ClO₄' does not interfere. Procedure with various combinations of ions is summarised. J. S. A.

Colorimetric procedure adapted to selenium determination. K. W. FRANK, R. BURRIS, and R. S. HUTTON (Ind. Eng. Chem. [Anal.], 1936, 8, 435).—Coloured ppts. of high dispersion are filtered on to a mat of BaSO₄, thus providing permanent standards. By this procedure 0.005—0.15 mg. of Se can be determined with an accuracy of 0.001—0.01 mg. E. S. H.

Conductometric determination of selenocyanide. R. RIPAN-TILICI (Z. anal. Chem., 1936, 107, 111—114).—SeCN' is titrated with Hg(ClO₄)₂ conductometrically. Discontinuities corresponding with the completion of the formation of [Hg(SeCN)]' or [Hg(SeCN)₃]', according to concn., and to Hg(SeCN)₂ are obtained. J. S. A.

Colorimetric determination of nitrates in water.—See B., 1936, 1182.

Determination of phosphate by weighing the molybdenum precipitate. G. JØRGENSEN (Z. anal. Chem., 1936, 107, 161—166).—Analytical methods (cf. B., 1935, 198) are critically reviewed. High accuracy is not attainable owing to slight

variability of the Mo:P ratio with differing conditions of pptn. J. S. A.

Determination of semimicro-quantities of phosphates in the form of a new complex compound, $[\text{Co}(\text{NH}_3)_5\text{NO}_3]\text{H}_3\text{PMo}_{12}\text{O}_{41}$, and observations on analogous arsenic and germanium compounds. N. H. FURMAN and H. M. STATE (Ind. Eng. Chem. [Anal.], 1936, 8, 420—423).—The prep. of $[\text{Co}(\text{NH}_3)_5\text{NO}_3]\text{H}_3\text{PMo}_{12}\text{O}_{41}$ (I) and of the compounds formed by $[\text{Co}(\text{NH}_3)_5]^{+++}$, $[\text{Cr}(\text{NH}_3)_6]^{+++}$, $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{++}$, $[\text{Co}(\text{NH}_3)_4\text{CO}_3]^{+}$, and $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]^{+}$ with the same acid is described. (I) may be used for the gravimetric determination of P in phosphate rocks, but the procedure is not suitable for P in steel. Ge can be pptd. as $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{H}_2\text{H}_4\text{Ge}(\text{Mo}_2\text{O}_7)_6$, but the reaction is not suitable for analysis. Similar As compounds can be produced. E. S. H.

Determination of arsenic in silver arsenate. A. POMERANTZ and W. M. McNABB (Ind. Eng. Chem. [Anal.], 1936, 8, 466).—As is determined by titrating the Ag with KI, using $\text{Ce}(\text{SO}_4)_2 \cdot 2(\text{NH}_4)_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ and starch as internal indicators. P, V, Mo, W, and Cr^{VI} interfere. E. S. H.

Determination of small amounts of arsenic in presence of tungstic acid. T. MILLNER and F. KUNOS (Z. anal. Chem., 1936, 107, 96—100).—Application of the method of Dieckmann and Hilpert (A., 1915, ii, 370) to very small amounts of As (1 mg. of As in 10 g. of WO_3) gives low results, due to oxidation of the CuCl employed, unless distillation be carried out in N_2 free from O_2 . J. S. A.

Origin of the Gutzeit test. F. W. F. ARNAUD; B. DYER (Analyst, 1936, 61, 757).—Mayençon and Bergeret's priority (Compt. rend., 1874, 79, 118) is affirmed (cf. Crossley, A., 1936, 1351). J. G.

Detection of boric acid with alizarin. L. SZEDELLEDY and S. TANAY (Z. anal. Chem., 1936, 107, 26—30).—The sensitivity of the test (A., 1929, 1255) is enhanced by examination in ultra-violet light. $\text{S}_2\text{O}_3^{--}$, Br^- , NO_3^- , Co, and Cr (1000 parts), which hinder detection by visible light, do not so interfere. Interference by I^- is eliminated by treatment with Ag_2SO_4 ; ClO_3^- is reduced with CH_2O ; Sb^{III} must be oxidised by $\text{Cl}_2\text{--H}_2\text{O}$. J. S. A.

Direct micro-titration of boric acid in mineral waters. C. SUMULEANU and M. BOTEZATU (Mikrochem., 1936, 21, 75—81).—To 0.5—5.0 c.c. of the mineral H_2O are added 3—4 drops of Me-red (saturated in EtOH at 60°), 3—4 drops of phenolphthalein (1%), and a drop of $\text{C}_6\text{H}_{17}\text{OH}$, and a strong current of CO_2 -free air is passed through the apparatus while 0.01N-HCl is added until an orange colour just persists. When all the CO_2 is removed, 0.5 c.c. of 10% mannitol solution is added and the solution is treated with 0.005N-Ba(OH)₂ to a red colour. > 5 mg. of Fe^{III} and Al^{III} per litre cause positive errors, and in such cases the H_3BO_3 should be determined after distillation. J. W. S.

Determination of silica in quartzite by fuming down with hydrofluoric acid. S. PALMQVIST (Z. anal. Chem., 1936, 107, 100—104).—Rapidity and

economy in HF are improved by heating the crucible from below on an Fe plate. An approx. formula for calculating $[\text{SiO}_2]$ on an undried sample is given.

J. S. A.

Photometric determination of silicate in seawater. R. J. ROBINSON and H. J. SPOOR (Ind. Eng. Chem. [Anal.], 1936, 8, 455—457).—Modified procedure, using the silicomolybdate method, is recommended. For permanent standards, K_2CrO_4 solutions may be replaced by picric acid. E. S. H.

Electrolytic determination of non-metallic inclusions in iron and steel.—See B., 1936, 1155.

Determination of small quantities of carbon monoxide in air.—See B., 1936, 1182.

Determination of carbon dioxide. G. W. CORNELL (Analyst, 1936, 61, 756—757).—The CO_2 is liberated at 60—70° and 20 mm. pressure and absorbed in 50 ml. of 0.25N-Ba(OH)₂. The method is also suitable for the standardisation of KMnO_4 by evolution of CO_2 from $\text{H}_2\text{C}_2\text{O}_4$, and on the micro-scale, for 0.5 mg. of CO_2 (cf. B., 1935, 123, 232). J. G.

Angular constants of microcrystalline profiles and silhouettes in the conclusive identification of substances. A. C. SHEAD (Proc. Oklahoma Acad. Sci., 1935, 15, 86—91).—Data are given for certain oxalates and various other compounds.

CH. ABS. (e)

Micro-chemical reaction of hydrocyanic acid with alloxan and various amines. M. T. KOSTLOVSKI and A. J. PENNER (Mikrochem., 1936, 21, 82—87).—Aliphatic amines show increasing sensitivity as reagents for determination of HCN with increasing mol. wt., NH_2Bu showing the greatest sensitivity of all the amines tested. The sensitivity of aliphatic amines does not increase with times of keeping in contact with HCN > 5 min. NH_2Ph , *o*-, *m*-, and *p*- $\text{C}_6\text{H}_4\text{Me}\cdot\text{NH}_2$, *o*-anisidine, $\text{NH}_2\cdot\text{C}_6\text{H}_4\cdot\text{OH}$, and NH_3 are all inferior to NH_2Bu or NH_2Pr . J. W. S.

[Analysis of] mixtures of argon and nitrogen. V. A. KONOVALOV and S. E. FRISCH (J. Tech. Phys. U.S.S.R., 1934, 4, 523—533).—A discharge tube with a hollow electrode enables a few tenths of 1% of A to be detected in N_2 , or *vice versa*. Quant. measurements may be made.

CH. ABS. (e)

Detection of potassium with racemic acid. L. SZEDELLEDY and J. JÓNÁS (Z. anal. Chem., 1936, 107, 114—116).—Small amounts of K are detected more readily with racemic acid than with *d*- or *l*-tartaric acid. The effect is due not to greater intrinsic sensitivity, but to the less pronounced tendency of K racemate to form supersaturated solutions.

J. S. A.

Determination of potassium with hexanitrodiphenylamine (dipicrylamine). A. WINKEL and H. MAAS (Angew. Chem., 1936, 49, 827—830).—The K salt of hexanitrodiphenylamine (HK) is pptd. by adding an excess of 25% aq. MgR_2 . The ppt. is dried at 100° and weighed as such. In presence of much Na, MgR_2 is added at 100°. The solution is then cooled to room temp. before filtration. KR is sol. in COMe_3 , and may be determined rapidly in COMe_3 solution

colorimetrically, by titration with TiCl_3 , or best, by conductometric titration with HCl or $1\text{-C}_{10}\text{H}_7\text{-SO}_3\text{H}$.

J. S. A.

Volumetric determination of potassium. W. DAUBNER (*Angew. Chem.*, 1936, 49, 830—831).—K H tartrate is pptd. by addition of a 50% aq. MeOH solution containing 2% of tartaric acid + 0.5% of NaOAc. The ppt. is washed with MeOH, suspended in H_2O at 70—80°, and titrated with NaOH. In mixtures of K, Mg, and Na, K is so determined, Mg is pptd. as $\text{MgNH}_4\text{AsO}_4$, and Na is finally determined by difference.

J. S. A.

Behaviour of perchloric acid in analytical work. Precautionary rules. E. DEISS (*Z. anal. Chem.*, 1936, 107, 8—14).—A severe explosion during the working up of filtrates from the pptn. of KClO_4 is traced to the formation of the violently explosive ester EtClO_4 , due to incomplete evaporation of EtOH in presence of HClO_4 . Such filtrates should never be conc. by evaporation.

J. S. A.

Determination of potassium hydroxide, carbonate, and permanganate present together. A. K. BASTANSHIAN and S. M. TRATZUN (J. Appl. Chem. Russ., 1936, 9, 1675—1678).— KMnO_4 is determined by the usual methods in a portion of solution, 15 ml. of 0.5N- H_2SO_4 are added to a second 10-ml. portion, to which 0.1N- $\text{H}_2\text{C}_2\text{O}_4$ is added to decolorisation, and excess of H_2SO_4 is titrated with 0.2N- Na_2CO_3 (Mane-orge). Finally, the $[\text{CO}_3^{2-}]$ of a third portion is determined gasometrically, and the KMnO_4 , KOH, and K_2CO_3 contents are hence calc.

R. T.

Micro- and semimicro-separation and determination of sodium and potassium. M. HEGEDUS (*Z. anal. Chem.*, 1936, 107, 166—175).—Na and K, which should be present as chlorides, are converted into iodides by evaporation with HI. NaI is then completely removed by repeated extraction with Bu^nOH + 1.5 vols. of Et_2O , previously saturated with KI. The NaI solution is evaporated down, with the addition of a little $\text{Na}_2\text{S}_2\text{O}_3$, and I' in each portion (KI and NaI, respectively) determined by oxidation to IO_3^- by Winkler's method.

J. S. A.

Polarographic studies with dropping mercury cathode. LXII. Increase of sensitivity in determination of alkali metals. J. HEYROVSKY and M. BUREŠ (*Coll. Czech. Chem. Comm.*, 1936, 8, 446—454).—In presence of dissolved O_2 or other reducible non-electrolyte (e.g., benzoquinone), the ionic migration current i is increased over the val. found in the absence of non-electrolytes by an amount which is independent of the concn. of alkali ions, but \propto concn. of non-electrolyte and \propto the ratio u/v of the ionic mobilities of the alkali and anion. The alkali concn. may be determined from the potential gradient, as measured by the displacement of the polarographic wave; the ratio Na:K may be calc. from the val. of u/v .

J. S. A.

Micro-colorimetric determination of sodium in mineral waters. S. SUMULEANU and M. BOTEZATU (*Mikrochem.*, 1936, 21, 68—74).—The reagent comprises 20 g. of $\text{UO}_2(\text{OAc})_2$ and 3.8 c.c. of AcOH diluted to 100 c.c. with H_2O , mixed hot with 60 g. of $\text{Zn}(\text{OAc})_2$ and 1.9 c.c. of AcOH also diluted to

100 c.c. with H_2O , there being added 300 c.c. of 96% EtOH and the solution filtered after being kept for some days in a brown bottle. 1 c.c. of solution to be tested (containing > 0.5 mg. of Na) is treated with 10 c.c. of reagent, shaken for 2 min., and kept for 0.5 hr. It is then centrifuged, the liquid decanted, and the ppt. washed thrice with EtOH saturated with $(\text{UO}_2)_3\text{MgNa}(\text{OAc})_9 \cdot n\text{H}_2\text{O}$. The pptd. is dissolved in H_2O , and 1 c.c. of 10% aq. pyrocatechol and 0.25 c.c. of N-NaOH are added. The colour is compared with standards.

J. W. S.

Spectral-analytical determination of alkali and alkaline-earth metals in aluminium and lead.—See B., 1936, 1211.

Quantitative flame spectral analysis of solutions. A. K. RUSANOV (*J. Gen. Chem. Russ.*, 1936, 6, 1057—1063).—The solutions are atomised at const. velocity into a C_2H_2 flame, and the thickness d of layers of coloured solutions (aq. CuSO_4 , KMnO_4) required to extinguish characteristic lines of the spectrum for different concns. C of salts is shown to be given approx. by $d = A \log C + B$, where A and B are consts. The limiting dilutions are: Li 0.00007, Na 0.00023, K 0.039, Ca 0.0004, Sr 0.0029, Ba 0.014, and Ti 0.02% (mean error ± 10 —15%).

R. T.

Determination of calcium as oxide. A. LEVINŠ (*Acta Univ. Latvien., Kim. Fak.*, 1935, [ii], 465—472).—The determination of Ca as CaO by igniting the carbonate or oxalate in a Bunsen burner or blast leads to error owing to contamination with SO_4^{2-} from the flame gases.

CH. ABS. (e)

Separation of strontium, barium, and lead from calcium and other metals by precipitation as nitrates. H. H. WILLARD and E. W. GOOD-SPEED (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 414—418).— $\text{Sr}(\text{NO}_3)_2$ is pptd. completely in cryst. form from aq. solutions, and separated from 28 other metals, by slowly adding 100% HNO_3 until the resulting solution contains $< 79\%$; to separate Ba 76% of HNO_3 suffices; Pb requires 84%, but the presence of Cl' makes it impossible to separate Pb from Sb and Sn. The solubility of $\text{Sr}(\text{NO}_3)_2$ does not increase appreciably with rise of temp. up to 70°.

E. S. H.

Determination of magnesium by alkalimetric titration. M. A. LOGAN (*J. Amer. Coll. Dentists*, 1934, 1, 46).—Mg is separated as the 8-hydroxyquinoline compound, converted into oxide, and determined by alkali titration. Citrate prevents simultaneous pptn. of interfering substances present in biological materials.

CH. ABS. (e)

Loss of magnesium in systematic qualitative analysis. P. AGOSTINI and T. BALDAZZI (*Annali Chim. Appl.*, 1936, 26, 427—430).—The amount of Mg carried down in the pptn. of the metals of the third group by aq. NH_3 and NH_4Cl is greatest for Al ($> 70\%$) and least for Fe. Further losses occur in the pptn. of CaCO_3 and BaCO_3 . Increase in the proportion of NH_4Cl reduces the losses. L. A. O'N.

Determination of zinc with an adsorption indicator. I. TANANAEV and M. GEORGIANI (*Z. anal. Chem.*, 1936, 107, 92—96).—Titration of Zn in neutral solution with $\text{K}_4\text{Fe}(\text{CN})_6$ at 60—65° in presence of Me-red yields, by adsorption, a pink

ppt., which changes sharply to yellow, with simultaneous peptisation of the ppt., at an end-point corresponding with the formation of $K_2Zn_3[Fe(CN)_6]_2$.

J. S. A.

Effect of the adsorption of ions from solution on the determination of zinc and of sulphate ion in zinc sulphate. J. G. TITOVA (J. Appl. Chem. Russ., 1936, 9, 1893—1897; cf. Tolkatshev and Titova, A., 1936, 302).—When an alkaline solution of $ZnSO_4$ is pptd. by CO_2 approx. 0.35% too much ZnO is found. The filtrate gives for $[SO_4]$ too high or too low vals. when the solution is strongly or slightly alkaline.

J. J. B.

Use of ethyl-blue as a redox indicator. I. Determination of lead and sulphate. I. TANANAEV and M. J. GEORGIOBIANI (J. Appl. Chem. Russ., 1936, 9, 1725—1728).—A few drops of aq. $K_3Fe(CN)_6$ and of aq. erioazurin B, and EtOH to 30%, are added to the solution, which is titrated with 0.05—0.1M- $K_4Fe(CN)_6$, to a bluish-violet coloration; trustworthy results are obtained for Pb^{++} in acid or neutral solution. SO_4^{--} is determined by adding $K_3Fe(CN)_6$, $K_4Fe(CN)_6$, indicator, and EtOH, and titrating with standard $Pb(NO_3)_2$, to a pink coloration. Reproducible results were not obtained for the titration of Mn^{++} or Ag^+ .

R. T.

Colorimetric determination of lead in low concentrations by means of diphenylsulphocarbazon, according to C. Fischer, using coloured glass standards. A. V. EVLANOVA (J. Appl. Chem. Russ., 1936, 9, 1690—1696).—10 ml. of solution are made slightly alkaline with aq. NH_3 , 5 ml. of 1% KCN and 0.5 ml. of 50% Na K tartrate are added, and the solution is shaken with 3 ml. of 6% diphenylsulphocarbazon (I) in CCl_4 . The CCl_4 layer, containing the red Pb salt of (I), is removed, and the operation is continued with 1-ml. portions of (I) until the CCl_4 layer remains colourless. The combined CCl_4 extracts are washed with 1% KCN and with H_2O , and CCl_4 is added to 10 ml. The intensity of coloration is compared with that of a series of coloured glass standards. Concns. of 0.1—10 mg. of Pb per litre may be determined, with an error of ± 0 —8%.

R. T.

Electro-analysis with small amounts of substances. F. HERNLER and R. PFENINGBERGER (Mikrochem., 1936, 21, 116—130).—A wire mesh electrode 10 mm. in diameter and 12 mm. high is used as anode and a Pt spiral as cathode. Conditions for separation of small quantities of Cu (from H_2SO_4 , HNO_3 , KCN, or NH_3 solution), Au (from KCN solution), and Hg (from HNO_3 solution) are described.

J. W. S.

Determination of small amounts of copper in tin by controlled potential.—See B., 1936, 1210.

Determination of mercury and its compounds. H. BRINDLE and C. E. WATERHOUSE (Quart. J. Pharm., 1936, 9, 519—527).—Examination of various known methods indicates that Rupp's method (A., 1906, ii, 902; 1907, ii, 720) as described in the B.P. 1932 is improved by addition of $CaCl_2$, which causes Hg to ppt. in a finely-divided form readily sol. in the 0.1N-I used. A new volumetric method which consists in reducing the Hg salt to Hg by alkaline

CH_2O , collecting the Hg on a sintered glass filter, dissolving in HNO_3 , and titrating with 0.1N- NH_4CNS , is described.

F. O. H.

Determination of mercury. Indirect volumetric method based on a critical study and improvement of the dichromate-pyridine method of Spacu and Dick. N. H. FURMAN and H. M. STATE (Ind. Eng. Chem. [Anal.], 1936, 8, 467—468).—Hg is pptd. as $[Hg(C_5H_5N)_2]Cr_2O_7$, which is titrated with I and $Na_2S_2O_3$ or with $FeSO_4$, either potentiometrically or with $NHPh_2$ as indicator.

E. S. H.

Highly sensitive drop reaction of cerium. L. KUHLEBERG (Mikrochem., 1936, 21, 35—37).—The test solution is pptd. with 1 drop of N-NaOH, the ppt. is washed 3—5 times with H_2O , and a drop of a solution of leuco-malachite-green (1% in 2% H_2SO_4) added. Ce gives a bluish-green or green colour, due to production of malachite-green by Ce^{IV} from oxidation of Ce^{III} . 3×10^{-8} g. of Ce is detectable in 0.1 c.c. of solution. $Mn(OH)_2$, $Co(OH)_2$, $Tl(OH)_3$, and Ag_2O have the same effect as $Ce(OH)_4$, but this may be avoided by pptn. with KCN instead of NaOH. In presence of $Th(OH)_4$ a drop of $K_4Fe(CN)_6$ should be added to the test solution and then KCN and NaOH, when the ppt. is free from Th. Large amounts of Ag^+ and Tl^+ are removed with NaCl and Na_2SO_4 , respectively, before pptn. of Ce.

J. W. S.

Magnetic analysis of the rare earths. M. N. PODASCHIEVSKI and V. V. KONDOGURI (Redk. Metal, 1935, 4, No. 1, 40—44).—The use of a modified Curie balance permits an analysis of a binary mixture with an error of 1—1.5%.

Ch. Abs. (e)

Determination of lanthanum with 8-hydroxyquinoline. T. I. PIRTEA (Z. anal. Chem., 1936, 107, 191—193).—La is pptd. by 8-hydroxyquinoline in presence of $NH_4OAc + NH_3$. The ppt. may be dried at 130° or determined bromometrically.

J. S. A.

Determination of actinium. V. V. KONDOGURI (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 250—257).—Ac is determined with 3—5% accuracy by measuring the α -radiation of the active ppt. obtained by exposing a negatively-charged Pt wire to Ac emanation.

Ch. Abs. (e)

Determination of aluminium salts by adsorptional titration. P. VUKOLOV (J. Appl. Chem. Russ., 1936, 9, 1679—1681).—The solution is titrated at 90° with 0.1N-KOH, in presence of a drop of 0.5% Congo-red, the end-point being attained when the solution becomes pink. The mean error is $\pm 0.5\%$.

R. T.

Alkalimetric determination of aluminium in presence of salts of monohydroxy-acids. I. A. V. PAVLINOVA (J. Appl. Chem. Russ., 1936, 9, 1682—1689).—Excess of 12% Na lactate (3 mols. per Al ion) is added to a solution of K alum, which is titrated with 0.1N-NaOH (phenolphthalein, completing the titration at 100°), when 3 equivs. of $NaOH = 1 Al^{+++}$. Alternatively, Na_3 citrate (< 1 mol. per Al ion) is added, and the solution is titrated at room temp. (thymolphthalein), when 2 equivs. of

$\text{NaOH} = 1 \text{ Al}^{+++}$. The reactions depend on displacement of H from the OH groups by Al^{+++} . R. T.

Use of tin amalgam in chemical analysis. I. TANANAEV and E. DAVITASCHVILI (Z. anal. Chem., 1936, 107, 175—180).— Fe^{+++} and Sn^{+++} are reduced by 8% Sn amalgam in 2N-HCl to Fe^{++} and Sn^{++} ; Cu^{++} , Hg, Sb⁺⁺⁺ and Sb⁺⁺⁺⁺, As⁺⁺⁺ and As⁺⁺⁺⁺, Pb⁺⁺, and Ag⁺ are reduced directly to the metal; MnO_2 to Mn^{++} . The Sn^{++} formed may in each case be titrated with $\text{K}_2\text{Cr}_2\text{O}_7$. J. S. A.

Micro-reactions. I. M. KORENMAN (Mikrochem., 1936, 21, 17—20; cf. A., 1934, 982).—Test paper is prepared by removing Ag from glossy or semi-matt bromide paper, washing, and soaking in reagent. The tests are carried out by touching the prepared paper with a drop of solution, when the colour reaction develops rapidly. Test limits found using about 0.00025 c.c. are Fe^{+++} [with 10% $\text{K}_4\text{Fe}(\text{CN})_6$] 8, Cu^{++} [with $\text{K}_4\text{Fe}(\text{CN})_6$] 25, Ni (with saturated dimethylglyoxime) 3, Sn^{++} (with 1% AuCl_3) 70, Au⁺⁺⁺ (with SnCl_2 , and pyrogallol) 160, S^{++} [with saturated $\text{Pb}(\text{OAc})_2$] 50, and NO_2^+ (with Griess' reagent) 2, all $\times 10^{-10}$ g., respectively. J. W. S.

Use of cupferron in spectral analysis. O. BAUDISCH (Arkiv Kemi, Min., Geol., 1936, 12, B, No. 8, 6 pp.).—Fe, Cu, and Ti are quantitatively separated from other elements by one pptn. with cupferron (I) from acid solutions. Cu is removed from the ppt. by digestion with aq. NH_3 . Dissolution of the ppt. in conc. HCl, followed by pptn. of Fe with H_2S , affords quant. separation from Ti, which may be reprecipitated with (I). All separations are spectroscopically quant. Fe, and any Cu present, may be separated from natural H_2O by adding HCl + (I). The liquid is extracted with Et_2O , which removes Fe and Cu quantitatively. Pptn. with (I) may be used for the prep. of spectroscopically pure Fe. J. S. A.

Use of complex cobalt compounds in qualitative analysis. M. P. BABKIN (J. Appl. Chem. Russ., 1936, 9, 1901—1906).— $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ (I) gives an insol. oxalate; (I) and $\text{Na}_2\text{S}_2\text{O}_3$ in hot H_2O afford a ppt. of $\text{Co}(\text{OH})\text{SO}_3 \cdot 2\text{Co}(\text{OH})_2$. $[\text{Co}(\text{NH}_3)_4](\text{NO}_3)_3$ yields ppts. with oxalates, chromates, and dichromates. J. J. B.

Determination of nickel in presence of copper. L. TURBIN (Maslo. Shir. Delo, 1935, 173—175).—Fe is used to liberate Cu from its compounds.

CH. ABS. (e)

Qualitative microscopic differentiation between chromate and dichromate ions. M. G. MALKO, L. K. YANOWSKI, and W. A. HYNES (Mikrochem., 1936, 21, 57—59).—With $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$, CrO_4^{--} and $\text{Cr}_2\text{O}_7^{--}$ yield $[\text{Co}(\text{NH}_3)_6]\text{CrO}_4\text{Cl}$ (lemon-yellow) and $[\text{Co}(\text{NH}_3)_6]_2(\text{Cr}_2\text{O}_7)_3$ (orange-yellow), respectively, of very different cryst. forms. This permits distinction between these ions in the absence of VO_3^+ , $\text{Fe}(\text{CN})_6^{--}$, $\text{Fe}(\text{CN})_6^{--}$, WO_4^{--} , MoO_4^{--} , $\text{S}_4\text{O}_6^{--}$, PO_4^{--} , and $\text{P}_2\text{O}_7^{--}$. J. W. S.

Removal of antimony from its solutions by nitric acid. M. B. RANE, K. KONDAIAH, and M. K. RATNAM (J. Indian Chem. Soc., 1936, 13, 544).— Sb_2O_4 and Sb_2O_5 are practically insol. in $> 6N$ -

HNO_3 , and the solubility of Sb_2O_3 is approx. 0.12% in $16N$ - HNO_3 . By repeated treatment and extraction of Sb salts with conc. HNO_3 , Sb can be quantitatively separated. C. R. H.

Micro-determination of antimony, arsenic, iodides, and thiocyanates by direct titration with potassium iodate. I. M. KORENMAN and Z. A. ANBROCH (Mikrochem., 1936, 21, 60—67).—The determination of these ions by titration with KIO_3 in presence of HCl and CHCl_3 is suitable for micro-methods. Details of procedure are given. J. W. S.

Microscopical quantitative analysis of antimony and bismuth. Tetraethylammonium iodide as a reagent. F. T. JONES and C. W. MASON (Ind. Eng. Chem. [Anal.], 1936, 8, 428—431).—When treated with NET_4I , 3N-HCl solutions of Sb^V give purple hexagonal plates, whilst Bi gives dark amber, triangular plates. E. S. H.

Separation of bismuth from cadmium. R. STREIBINGER and G. ORTNER (Z. anal. Chem., 1936, 107, 14—17).—Pptn. of Bi as BiOI (A., 1928, 388) affords a quant. separation from Cd. The method is applicable to fusible Bi-Pb-Sn-Cd alloys. J. S. A.

Adjustable sensitive thermoregulator. J. Y. YEE and R. O. E. DAVIS (Ind. Eng. Chem. [Anal.], 1936, 8, 477).—With the regulator the temp. of a 36-litre thermostat can be kept at 25°, 30°, 35°, or $40^\circ \pm 0.001^\circ$. E. S. H.

Determination of specific heat and thermal conductivity in a single experiment without thermometry. W. M. EVANS (Phil. Mag., 1936, [vii], 22, 833—837).—The substance, in the form of a sphere or a spherical metal shell filled with a powder, is heated by steam. The sp. heat is deduced from the total wt. of steam condensed and the thermal conductivity from intermediate wts. H. J. E.

Flask oven. O. TREICHEL (Chem.-Ztg., 1936, 60, 927).—An air-bath for heating distilling flasks is described. J. S. A.

Laboratory-made blast lamp. C. R. MOONEY and A. LOWMAN (Science, 1936, 84, 296). L. S. T.

Improved design of Rodgers ring burner. G. F. SMITH (Ind. Eng. Chem. [Anal.], 1936, 8, 484—485). E. S. H.

Photo-electric spectrophotometer of high accuracy. J. S. PRESTON and F. W. CUCKOW (Proc. Physical Soc., 1936, 48, 869—880).—A description and tests are given for an instrument employing as light-sensitive element a modern-type vac. emission photo-cell with central plate cathode. The instrument has a linear response over the necessary range, is highly sensitive, electrically and mechanically stable, and avoids stray light in the incident beam. Standard spectral transmission measurements are given, in good agreement with international figures. N. M. B.

Automatic recording spectrograph for near infra-red (6000—9500 Å.). P. BARCHEWITZ and A. NAHERNIAC (Compt. rend., 1936, 203, 715—716).—A plane-grating spectrograph, in which the energy

distribution in the spectrum is automatically recorded through a photo-cell and amplifier, is described.

A. J. E. W.

Photographic light-filter cell. C. A. MITCHELL and T. J. WARD (Analyst, 1936, 61, 751—755).—A small rectangular glass cell is fitted closely on the flange of the camera lens or microscope objective by means of a cardboard tube. Filter solutions are described for various colours, for ultra-violet and infra-red radiations, and for chlorophyll. J. G.

Use of phosphorescent materials in airship navigation. Apparatus for measuring very small light intensities. M. ROULLEAU (Publ. sci. tech. Min. de l'Air, No. 48, 1—49; Chem. Zentr., 1936, i, 1056).—The apparatus is described. Data for the min. light intensity from phosphorescent materials necessary for reading scales etc. at various distances are given.

H. J. E.

X-Ray structure analysis. A. I. KRASNIKOV (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 325—329).—A simplified X-ray tube with a cylindrical anticathode is described.

CH. ABS. (e)

Camera for determination of the identity period in X-ray structure analysis. E. F. BACHMETEV (Tech. Phys. U.S.S.R., 1934, 1, 370—375, and J. Tech. Phys. U.S.S.R., 1935, 5, 118—123).—The instrument is described. It facilitates identity period determinations.

CH. ABS. (e)

Colorimetry with the photo-electric cell. II. K. YAMAMOTO and M. ABE (Bull. Waseda Appl. Chem. Soc., 1935, 25, 1—10; cf. A., 1934, 748).—Exact microcolorimetric determinations may be carried out by proper selection of the photo-electric cell, luminosity, and thickness of layer.

CH. ABS. (e)

New type of colorimeter. E. R. BOLTON and K. A. WILLIAMS (J. Soc. Leather Trades Chem., 1936, 20, 504—512).—A light beam is passed through six filters, each giving light of different λ , and the absorption thereof by the solution under examination is measured by a photo-electric colorimeter (described).

D. W.

Solutions for colorimetric standards. VII. Aqueous solutions of salts of elements 23—29. C. T. KASLINE [with M. G. MELLON] (Ind. Eng. Chem. [Anal.], 1936, 8, 463—465; cf. A., 1935, 835).—Spectral transmission curves in the visible region for aq. $\text{Ce}(\text{SO}_4)_2$ and various salts of elements of at. no. 23—29 have been determined.

E. S. H.

Lead or other low-melting metals for X-ray targets. T. R. FOLSOM (Rev. Sci. Instr., 1936, [ii], 7, 406—408).—Pb, electroplated on a thin water-cooled Cu disc, will withstand ≈ 2 milliamp. per sq. cm. electron bombardment at 650 kv.

C. W. G.

[Apparatus for studying] Raman effect. C. SANNIE, L. AMY, and V. POREMSKY (Bull. Soc. chim., 1936, [v], 3, 2018—2027). Details of an experimental arrangement for studying Raman spectra, inexpensive and suitable for chemical work, are given. The chief feature is the use of a Hg arc with a double filter, with which only one exposure is required.

F. L. U.

Apparatus for the transformation of light of long wave-length into light of short wave-length.

II. Influence of magnetic fields. F. COETERIER and M. C. TEVES (Physica, 1936, 3, 968—976; cf. A., 1934, 624).—Improved definition is obtained by magnetic focussing of the photo-electrons.

O. D. S.

Dichroic crystals and their application for polarisation filters. M. HAASE (Z. wiss. Phot., 1936, 35, 236—237).—The advantages, in particular the better transparency and non-cloudiness, of the Zeiss-Herotar filter (a uniform layer of heraphathite) in comparison with the Polaroid filter are described.

J. L.

Apparatus for conveniently taking equi-inclination Weissenberg photographs. M. J. BUEGER (Z. Krist., 1936, 94, 87—99; cf. *ibid.*, 88, 356; 91, 255).

B. W. R.

Standard liquids for the microscopical determination of refractive index. A. H. KUNZ and J. SPULNIK (Ind. Eng. Chem. [Anal.], 1936, 8, 485).—Series of liquids varying from $n = 1.655$ to $n = 1.385$ with intervals of 0.005 can be prepared using binary mixtures of $1\text{-C}_{10}\text{H}_7\text{Br}$, Bu^+ phthalate, heptioic acid, mesitylene, and EtCO_2Et .

E. S. H.

Interference method of determining refractive index with a microscope. N. VEDENEJEVA, S. GRUM-GRSHIMAILO, and A. VOLKOV (Acta Physicochim. U.R.S.S., 1936, 5, 391—404).—Details are given, and the application of the method to the determination of n of mixtures of AsI_3 or SbI_3 and piperine and of S and Se is described.

C. R. H.

Fluorescent light microscopy. Applications to industrial research. C. J. FROSCH and E. A. HAUSER (Ind. Eng. Chem. [Anal.], 1936, 8, 423—426).—A review, with special reference to the study of emulsions.

E. S. H.

Hydrogen electrode without streaming hydrogen. P. NYLÉN (Svensk Kem. Tidskr., 1936, 48, 76—91).—Pt wires are coated with Pd-black and saturated with H_2 by placing in aq. HCO_2H . The p.d. is reproducible, linear with p_{H} , and corresponds with H_2 at 6.5 mm. Hg. The electrode is unaffected by pressure changes, presence of salts, oxidising agents, NH_3 , or cathodic or anodic polarisation, and is especially suitable for biochemical measurements.

M. H. M. A.

Triodometer. Apparatus for electrometric volumetric analysis. U. EHRHARDT (Chem. Fabr., 1936, 9, 509—517).—Triode valve circuits and auxiliary apparatus (potentiometric and conductivity titration cells, glass electrode, graduated conductivity cells of variable cell const., etc.) are described for direct end-point indicating methods of potentiometric and conductometric titration and for dielectric const. analysis.

J. S. A.

Application of the methods of electronic optics to mass spectrography. L. CARTAN (Compt. rend., 1936, 203, 867—869).—To utilise as many as possible of the positive ions emitted by the source an arrangement is developed in which focus is obtained without deviation by the use of a "lens" comprising three brass rings arranged in series with their axes along the centre of the pencil of positive rays. The centre ring

is crossed by a network of metallic wire and is negatively charged, whilst the outer rings are earthed.

J. W. S.

Resolving power in the electron microscope. L. MARTON (*Physica*, 1936, 3, 959—967).—Theoretical. A distinction is made between the surface resolving power, calc. by the Abbe formula, and the depth resolving power, or min. thickness of the object necessary for observation, of the electron microscope. The latter is calc. in the first approximation.

O. D. S.

Technique of ultramicro-electrophoresis. G. E. VAN GILS and H. R. KRUYT (*Kolloid-Beih.*, 1936, 45, 60—98).—Theory and practice are reviewed, and modified apparatus is described.

E. S. H.

Starting potentials of Geiger-Müller counters. C. L. HAINES (*Rev. Sci. Instr.*, 1936, [ii], 7, 411—413).—Data for air, He, H₂, O₂, A, and two A-O₂ mixtures are given.

C. W. G.

Continuously active cloud chamber. R. E. VOLLRATH (*Rev. Sci. Instr.*, 1936, [ii], 7, 409—410).—HCl and H₂O vapours diffusing together produce a mixture supersaturated with respect to both; this is suitable for demonstration purposes, but not for photographic recording.

C. W. G.

Use of a capillary analytical method for micro-analytical purposes. G. SELÉNYI (*Magyar chem. Fol.*, 1935, 41, 3—4; *Chem. Zentr.*, 1936, i, 1056).—The reactions are carried out in a soap solution membrane instead of on filter-paper.

H. J. E.

Device for oxygen absorption in gas analysis. F. S. COTTON (*J. Lab. Clin. Med.*, 1935, 20, 1084—1087).—A modification of the Krogh pipette is described.

CH. ABS. (e)

Laboratory-scale ebullition tube. J. W. BOEGEL (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 476).

E. S. H.

Apparatus for fractional distillation of liquefied gases. A. ROSE (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 478—483).—Apparatus is described and results for the separation of gaseous mixtures are recorded.

E. S. H.

Application of vacuum distillation. N. LUZANSKI (*Tids. Kjemi*, 1936, 16, 142—144).—Apparatus and determinations of basicity and total N are described.

M. H. M. A.

Micro-distillation apparatus. J. W. YOUNG (*Mikrochem.*, 1936, 21, 133—134).—A small tube with an indented fractionating column attached, suitable for distilling 0.2—0.5 c.c. of liquid, is described.

J. W. S.

Construction of glass helices for packing fractionating columns. Rapid mechanical method. W. W. STEWART (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 451—452).—Apparatus for winding a glass spiral with a fibre diameter of about 0.6 mm. and 11 turns per cm. is described. The spirals are subsequently cut into single-turn helices.

E. S. H.

Laboratory cements and waxes. L. WALDEN (*J. Sci. Instr.*, 1936, 13, 345—352).—A survey.

C. W. G.

Modified mercury trap. J. E. CRACKSTON (*J. Sci. Instr.*, 1936, 13, 371).—Umbrella-shaped baffle plates increase the frequency of contact of Hg atoms with the cold surface.

C. W. G.

Method and apparatus for determining specific gravity of liquids. J. CIOCHINA (*Z. anal. Chem.*, 1936, 107, 108—111).—A modified balanced column method is described.

J. S. A.

Adjustable vacuum leak. W. R. SMYTHE (*Rev. Sci. Instr.*, 1936, [ii], 7, 435).—The length of porcelain tube, through the walls of which incoming gas must diffuse, is altered by raising or lowering Hg.

C. W. G.

Valve to prevent sucking back in wide vacuum tubing. L. RAMBERG (*Svensk Kem. Tidskr.*, 1936, 48, 99—100).—A simple device is described.

M. H. M. A.

Determination of pressure of carbon dioxide in small amounts of liquids containing carbonic acid. Y. KAUKO and V. MANTERE (*Z. anal. Chem.*, 1936, 107, 81—85).—By means of an apparatus described, a small vol. of air is circulated through the liquid under examination, and through 0.003M-NaHCO₃, until an equilibrium pressure of CO₂ is established. The [CO₂] in the NaHCO₃ is then determined potentiometrically as described previously (cf. B., 1935, 926). By employing several successive small quantities of the liquid, each 1 c.c., the [CO₂] is brought to the true equilibrium val. The method is applicable to 5 c.c. of liquid, e.g., to biological fluids such as blood.

J. S. A.

Micro-drilling machine for the separation of inclusions in section. A. K. RUSSANOV (*Mikrochem.*, 1936, 21, 98—101).—A machine is described suitable for drilling out samples from minerals, a microscope being arranged to permit vision of the specimen being sampled.

J. W. S.

Preparation of laboratory refractory crucibles. P. S. ROLLER, D. RITTENBERG, and A. GABRIEL (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 486).—Modified technique is described (cf. A., 1932, 593).

E. S. H.

Sealed stirrer. L. S. POWELL (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 488).

E. S. H.

Automatic levelling device for gas collection by downward displacement of mercury. L. D. WILSON (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 488).

E. S. H.

Variable vapour-volume barometric type of vapour-pressure apparatus. E. M. BARBER and A. V. RITCHIE (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 472—476).—Apparatus and technique are described, and applications to the measurement of evaporation losses and vapour-locking characteristics of gasoline discussed.

E. S. H.

Constant-volume dialyser. C. B. KREMER (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 468).

E. S. H.

Metal extractor for laboratory use. J. M. LEMON, F. P. GRIFFITHS, and M. E. STANSBY (*Ind. Eng. Chem. [Anal.]*, 1936, 8, 462).—Apparatus for

the solvent extraction of relatively large amounts of material is described. E. S. H.

Use of calculations and nomographic methods for indirect analysis of mixtures. I. Mixtures of iron oxides with metallic iron. J. V. KARJAKIN and V. N. VINOGRADOV (Z. anal. Chem., 1936, 107, 181—186).—A nomogram is given for calculating

FeO, Fe₂O₃, Fe₃O₄, and free Fe from determinations of FeO and total Fe. J. S. A.

Discovery of hafnium. G. HEVESY (Current Sci., 1936, 5, 236—240).

Diagrams of Chinese alchemical apparatus. W. H. BARNES (J. Chem. Educ., 1936, 13, 453—457; cf. *ibid.*, 1934, 11, 655). L. S. T.

Geochemistry.

Spectral analysis of mineral waters. M. T. LINDTROP and J. M. TOLMATSHEV (Compt. rend. Acad. Sci. U.R.S.S., 1936, 3, 321—324).—An analysis of Caucasian mineral waters for Li, Rb, and Cs, by means of a Hilger spectrograph, has been made. Li and Rb are present in all waters and Cs detected in a few samples, but in too small proportion to be determined. The various waters can be divided into three groups according to the val. of the ratios Na : Li and K : Rb. D. C. J.

Hot springs of the Yellowstone National Park. E. T. ALLEN and A. L. DAY (Proc. V Pacific Sci. Congr., 1934, 3, 2275—2283).—A discussion. CH. ABS. (e)

Mineral waters of the province of Sassari (Ploaghe, Siligo, Thiesi). A. SERRA (Atti V Congr. naz. Chim., 1936, 222—230).—A review.

Sulphurous mineral water of the lower lake of Fontana Liri (Frosinone) called "Solfatara." M. TALENTI and A. RAGNO (Annali Chim. Appl., 1936, 26, 398—405).—A chemical and physico-chemical analysis of the H₂O, which contains chiefly Ca(HCO₃)₂ and Mg(HCO₃)₂, has been made. L. A. O'N.

Analysis of thermal sulphur spring of Varazdinske Toplice. H. IVEKOVIC and L. DANČEVIC (Cas. Vod. Plin. Sanit. Tehn., 1936, 2, 234—235).—Analytical data differ from those of 1895 in the lower Na and higher K contents. R. T.

Analysis of thermal waters of Szeged. I. STETINA (Z. Unters. Lebensm., 1936, 72, 234—235). E. C. S.

Geological characteristics of mineral springs of Meltingen. J. CADISCH (Mitt. Lebensm. Hyg., 1936, 27, 382). E. C. S.

Analysis of (A) the Vrdnik thermal spring, (B) the Vilma spring of Slatina Radenci. S. MIHOLIC (Bull. Soc. Chim. Yougoslav., 1936, 7, 21—29, 31—34).—The respective waters contain Na 155.4, 1835, K 1.339, 157.3, Li 0.0607, 0.425, Ca 33.02, 160.2, Mg 31.56, 61.89, Sr 0.6735, 1.306, Ba 0.0022, 0.0197, Mn 0.0043, 0.1194, Zn 0.0095, 0.0403, Sn 0.024, 0.0046, Pb 0.0066, 0.0127, Cl' 40.4, 428, Br' 0.149, 1.981, I' 0.0116, 0.354, SO₄' 134.0, 261.5, HCO₃' 453.9, 4849, SiO₂ 22.82, 16.6, TiO₂ 0.0459, 0.044, Al₂O₃ 0.461, 0.194, and Fe₂O₃ 0.351, 5.638 mg. per kg. R. T.

Geochemical composition of ocean and continental water (from Baikal). B. N. FORSCH (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 145—

148).—The concn. (c_n) of C, N, O, Na, Mg, Al, Si, P, S, Cl, K, and Ca has been determined at the reservoir at Baikal, and has been compared with the concn. in the ocean (c_o). log c_n/c_o when plotted against group no. in the periodic table gives a graph with a max. at group IV, groups I and VII giving the lowest val. R. S. B.

Meteorites (aerolites) found in the Tanezrouft (Western Sahara). A. LACROIX (Compt. rend., 1936, 203, 901—903).—A description and a chemical analysis are given. A. J. E. W.

Origin of the emery deposits near Peekskill, New York. J. W. BUTLER, jun. (Amer. Min., 1936, 21, 537—574).—From detailed field and petrological studies it is concluded that the emery was formed by contact-metamorphic (pyrometasomatic) action of the basic Cortlandt intrusive on Manhattan schist, liquid or gaseous emanations being released by the magma during intrusion. Detailed descriptions of the deposits, the rock types, and their relations are given. L. S. T.

Roselite and the rule of highest pseudo-symmetry. M. A. PEACOCK (Amer. Min., 1936, 21, 589—603).—A revision of the geometrical and optical crystallography of roselite from Schneeberg, Saxony, shows that it is monoclinic prismatic, $a:b:c = 0.8780:1:0.4398$, $\beta = 100^\circ 53'$, and homeomorphous with brandtite. L. S. T.

Cummingtonite from the Black Hills, S. Dakota. R. G. WAYLAND (Amer. Min., 1936, 21, 607—610).—X-Ray powder diagrams give a mean val. of $a:b:c = 0.5224:1:0.2932$, space-group ; 2 mols. per cell. L. S. T.

Occurrence of barite in the red beds of Colorado. A. L. HOWLAND (Amer. Min., 1936, 21, 584—588).—An analysis is given. Sr is absent. L. S. T.

Radioactivity of bituminous shale. II. L. M. KURBATOV (Chim. Tverd. Topl., 1935, 6, 288—291; cf. A., 1936, 49).—Shale in the Petrograd district had γ -ray activity of 34.2—84.9 ions per c.c. per sec. It contained K 6—8 and V 0.27—0.30%. CH. ABS. (e)

Conditions of formation of kaolin, montmorillonite, sericite, pyrophyllite, and analcime. W. NOLL (Tsch. Min. Petr. Mitt., 1936, 48, 210—247).—Recapitulation of previous papers (A., 1932, 583, 716; 1934, 752; 1935, 601; 1936, 449, 584, 1228), with further discussion of the bearing of experi-

mental synthesis on the formation of these minerals in nature.

L. J. S.

Petrogenesis: Kiloran Bay, Colonsay. I. Transfusion of quartzite. D. L. REYNOLDS [with A. GIBBS] (Min. Mag., 1936, 24, 367—407).—Blocks of quartzite enclosed in amphibolite show concentric zones of micropegmatite, syenite, and appinite, with a residual core of quartzite. Chemical analyses show that there has been a transfusion of material into the quartzite, and it is suggested that such a process on a large scale may give rise to different types of magmas.

L. J. S.

Greenalite-chert in Ordovician rocks, Scotland. W. Q. KENNEDY (Min. Mag., 1936, 24, 433—436).—A dark green to black cherty rock from Glenluce, Wigtownshire, contains abundant granules of a greenish isotropic mineral embedded in a base of silica. Analysis of the rock (SiO_2 71.08, FeO 18.53, H_2O 6.40%, etc.) and the optical characters suggest that this mineral is greenalite ($3\text{FeO} \cdot 4\text{SiO}_2 \cdot 2\text{H}_2\text{O}$), which previously has been known only in the Fe ores of the Lake Superior district. The origin of these ores is discussed.

L. J. S.

Occurrence of gersdorffite in N.E. Dundas, Tasmania. F. L. STILLWELL (Proc. Austral. Inst. Min. Met., 1935, 465—476).—Gersdorffite (NiAsS) has been found associated with pyritic minerals in a lode traversing the Dundas slates and quartzites. Small amounts of jamesonite, cosalite, aikinite, and bournonite are also present.

A. R. P.

Sanidine and sanidin rocks. R. BRAUNS (Tsch. Min. Petr. Mitt., 1936, 48, 248—252). G. KALB (*ibid.*, 253—254).—A question of nomenclature.

Content of scattered elements in some fluorites of the U.S.S.R. I. P. ALIMARIN and R. E. AREST-JAKUBOVITSCH (Bull. Soc. nat. Moscou, Sect. geol., 1934, 12, 575—583).—Various specimens of fluorite showed traces of Li, Na, K, Sr, Be, Cu, Al, Fe, and S.

CH. ABS. (e)

Identification of kimberlite and kimberlite minerals by spectroscopic and other methods. F. C. PARTRIDGE (Trans. Geol. Soc. S. Africa, 1934, 37, 205—211).—Kimberlite garnets on spectroscopic analysis give a characteristic spectrum consisting of strong lines of Mg, Fe, Al, and Ca. Cr and traces of Mn and Ti are present. Ilmenite, olivine, and diopsides from kimberlite also give characteristic lines.

CH. ABS. (e)

Origin of certain systems of ore-bearing fractures. W. H. EMMONS (Trans. Amer. Inst. Min. Met. Eng., 1935, 115, 9—35).—A discussion.

CH. ABS. (e)

Influence of geological factors on the productivity of phosphorite layers. V. I. MALINOVSKAJA (Min. Udob. i Insektofungi., 1935, 1, No. 3, 32—40).—In the Aktiubinsk region the productivity of the phosphorite beds increases with the distance from the shore.

CH. ABS. (e)

Differentiation and relationship of rocks of the Bushveld complex. B. V. LOMBARD (Trans.

Geol. Soc. S. Africa, 1934, 37, 5—52).—Fourteen analyses are given. The Bushveld rocks are discussed.

CH. ABS. (e)

Alterations effected by solutions in the limestones of the dolomite series. R. B. YOUNG (Trans. Geol. Soc. S. Africa, 1934, 37, 163—169).

CH. ABS. (e)

Process of microclinalisation. D. GUIMARAES (Ann. Acad. Brasil. Sci., 1936, 8, 205—215).—Some gneissified Brazilian granite rocks, containing perthite and microperthite, are described. The plagioclase included perthitically is more frequently oligoclase than albite.

L. A. O'N.

Diamond from the new deposit in the Syuren river basin (Bashkir). V. A. SILBERMINTZ and E. M. BONSTEDT (Compt. rend. Acad. Sci. U.R.S.S., 1936, 3, 329—331).—A description of the discovery and properties of a diamond of 1.165 carats in an area in the Urals not hitherto known to be diamond-bearing is given.

D. C. J.

Cuprosklodowskite. A. SCHOEF (Natuurwetensch. Tijds., 1936, 18, 282—283).—Cuprosklodowskite from Katanga occurs in association with chrysocolla, vandenbrandite, gummite, and malachite, but principally with casolite and sklodowskite (I), as rhombic pale green needles having a silky gloss; according to Novaček their composition is $\text{CuO} \cdot 2\text{UO}_3 \cdot 2\text{SiO}_2 \cdot 6\text{H}_2\text{O}$ (Mem. Soc. Sci. Boheme, 1935, 1). They are pleochroic and have a high dispersion val., n 1.66—1.68, and a lavender-blue polarisation colour; they are distinguished optically from (I) by their lower double-refraction val.

Uranotile and sklodowskite. V. BILLIET (Natuurwetensch. Tijds., 1936, 18, 284—303; cf. preceding abstract).—Chemical and X-ray data obtained for Wolsendorf uranotile (I) and Shinkolobwe sklodowskite (II), respectively, are: formulæ, $\text{CaO} \cdot 2\text{UO}_3 \cdot 2\text{SiO}_2 \cdot 6\text{H}_2\text{O}$ and $\text{MgO} \cdot 2\text{UO}_3 \cdot 2\text{SiO}_2 \cdot 6\text{H}_2\text{O}$; a , 6.68, 6.67; b , 15.28, 15.50; c , 7.31, 7.12 Å.; $a:b:c$, 0.4371:1:0.4784 and 0.4303:1:0.4593; σ 3.81, 3.77. Results of other workers are also tabulated. The X-ray diagrams are very similar in both cases, and it is considered that (I) and (II) have analogous lattices and are isomorphous. The abs. val. of the parameter c of cuprosklodowskite from Katanga is 7.23 Å.; it is unlikely that it has the same structure as (I).

J. G.

Formation of argillaceous colloids in spontaneous change of granite in a lysimeter cell. A. DEMOLON and E. BASTISSE (Compt. rend., 1936, 203, 736—738).—The chemical and physical changes produced by allowing rain H_2O to percolate through crushed granite over a period of 5 years are described.

A. J. E. W.

Boeton-asphalt and heavy hydrogen (deuterium). S. H. BERTRAM and H. MENDEL (Chem. Weekblad, 1936, 33, 687—689).— H_2O obtained by combustion of natural (Boeton) asphalt has d 1.000011 compared with ordinary H_2O .

S. C.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

FEBRUARY, 1937.

Production of a hydrogen continuum of high intensity by means of a hot-cathode tube. G. JACOBI (Physikal. Z., 1936, 37, 808—810).—The construction of a H_2 discharge tube with a heated cathode for the production of a continuous spectrum in the ultra-violet is described. The advantages of the tube are the low potential required (100 volts) and the fact that H_2O -cooling is not necessary. A. J. M.

Line intensity variations in the hydrogen high-frequency glow discharge. G. W. FOX and C. H. BACHMAN (Physical Rev., 1936, [ii], 50, 939—942).—Lines of the Balmer series excited in a high-frequency glow discharge in H_2 for $\lambda\lambda$ range 5.1—32.5 m. and pressure range 5—300 microns, and studied spectroscopically in conjunction with a logarithmic sector disc, show variations in intensity ratios with excitation frequency, a region of which produces min. excitation of each term with respect to H_α , and depends on the pressure and term under consideration. Ionisation efficiency and intensities of the higher series terms vary approx. directly with each other if cumulative ionisation is negligible. Intensities of higher terms increase with decreasing pressure down to about 10 microns, below which and H_γ continue to increase in intensity while higher terms decrease. Satisfactory curves can be calc. N. M. B.

Anomalous intensities in the band system $2p^1\Sigma_u \rightarrow 1s^1\Sigma_g$ ($v' = 3 \rightarrow v'' = 0$ to 11) of the HD molecule. O. BEWERSDORFF (Z. Physik, 1936, 103, 598—620).—The Lyman bands obtained by Beutler and Mie have been analysed and a theory is developed for the explanation of the anomalous intensities observed. A. E. M.

Comparative measurements of the normal cathodic discharge constants in light and heavy hydrogen. A. GUNTHER-SCHULZE and H. SCHNITGER (Z. Physik, 1936, 103, 491—494).—Discharges in 1H_2 and 3H_2 were compared over a pressure range of 1—3 mm. Hg. In 3H_2 the min. discharge voltage was 9.3% >, the normal current density 36.7% <, the luminosity 22.1% >, and the distance from the anode at which the anodic glow disappears 12.1% >, in 1H_2 . H. C. G.

Field-strength in the column of the glow discharge in light and heavy hydrogen. M. STEENBECK (Physikal. Z., 1936, 37, 823—824).—The potential of the positive column in D_2 is < in H_2 . Determination of the field-strength in the column and the electron temp. in discharges in H_2 and D_2 under identical conditions gives results in agreement with the diffusion theory of the positive column. A. J. M.

Wave-length standards in the extreme ultra-violet. K. R. MORE and C. A. RIEKE (Physical Rev., 1936, [ii], 50, 1054—1056; cf. Shenstone, A., 1936, 537).—To obviate errors in the method of overlapping orders, the $\lambda\lambda$ of several lines of C, N, and O were determined by comparison of the first-order lines with certain first-order lines of Cu II. Results are in good agreement with independent data, and weighted mean vals. are suggested as standards from 1658 to 833 Å. N. M. B.

Rotation analysis of O_2^+ , $^2\Pi \rightarrow ^2\Pi$ bands. L. VON BOŽOKY (Z. Physik, 1937, 104, 275—290).—New bands in the region $\lambda\lambda$ 4363 to 2343 Å. obtained by high-frequency excitation of O_2 have been examined at a dispersion of 1.2 Å. per mm. The moment of inertia and the internuclear distances for the two states are respectively 26.0902 and 16.5650×10^{-40} cm.² g., and 1.406 and 1.121×10^{-8} cm. L. G. G.

"Clean-up" of inert gases in the electric discharge. I. H. ALTERTHUM, A. LOMPE, and R. SEELIGER (Physikal. Z., 1936, 37, 833—838).—Quant. investigation of the "clean-up" of inert gases, particularly Ne, in the glow discharge leads to results incompatible with the theory that the gas is adsorbed by particles sputtered from the cathode. The best assumption is that the gas is shot into the cathode metal in the form of ions. All observations agree with this theory except the fact that the velocity of removal of the inert gas decreases as the pressure increases. A. J. M.

Zeeman effect of alkali metals according to the Dirac equation. R. SCHLATTERER (Ann. Physik, 1936, [v], 27, 643—663).—Mathematical. The Voigt-Sommerfeld formula for the Zeeman splitting of doublet systems is deduced from the Dirac equation. O. D. S.

Mg i-like spectra of the elements Ti to Co, Ti XI, V XII, Cr XIII, Mn XIV, Fe XV, and Co XVI. B. EDLÉN (Z. Physik, 1936, 103, 536—541).—In the vac. spark spectra of Ti, V, Cr, Mn, Fe, and Co in the region 126—47 Å. 10—15 lines for each element are identified as combinations in a Mg i-like spectrum; term systems are calc. The same elements also exhibit doublet combinations in an Al i-like spectrum. H. C. G.

S i-like spectra of the elements titanium to iron, Ti VII, V VIII, Cr IX, Mn X, and Fe XI. B. EDLÉN (Z. Physik, 1937, 104, 188—193). L. G. G.

Quadrupole moment and magnetic moment of ^{69}Ga and ^{71}Ga . H. SCHÜLER and H. KORSCHING (Z. Physik, 1936, 103, 434—442).—From the triplet

4s5s, 3S_1 -4s5p, $^3P_{0,1,2}$ of the Ga II spectrum the quadrupole moment of ^{69}Ga was found to be $q = +1 \times 10^{-24}$; for ^{71}Ga $q = 0 \pm 0.5 \times 10^{-24}$. Magnetic moments obtained from Ga I and Ga II were in good agreement; $\mu_{69} = +2.0$ and $\mu_{71} = +2.5$ nuclear magnetons.

A. E. M.

Continuous absorption band of rubidium in the presence of foreign gases. N. T. ZE and C. S. YI (Nature, 1936, 138, 1055). The position of the new band observed in presence of Ne, He, H_2 , or N_2 depends on the nature of the foreign gas. The absorption may be produced by a Rb atom at the moment of a collision with a foreign gas atom.

L. S. T.

Hyperfine structure of Rb resonance lines. H. KOPFERMANN and H. KRÜGER (Z. Physik, 1936, 103, 485-490).—The hyperfine structure of the two resonance lines $\lambda = 7947 \text{ \AA}$. ($5^2S_{1/2} - 5^2P_{1/2}$) and $\lambda = 7800 \text{ \AA}$. ($5^2S_{1/2} - 5^2P_{3/2}$) has been examined. The separation of the ground states $5^2S_{1/2}$ was $\Delta\nu = 0.228 \text{ cm}^{-1}$ for Rb 87 and $\Delta\nu = 0.101 \text{ cm}^{-1}$ for Rb 85. The ratio of the nuclear magnetic moments $\mu_{87} : \mu_{85}$ is 2.03; $\mu_{87} = 2.8$ and μ_{85} is 1.4 nuclear magnetons.

H. C. G.

Absorption and fluorescence spectra of indium vapour. R. WAJNKRAAN (Z. Physik, 1936, 104, 122-131).—These spectra have been studied over the temp. range 600-1000°. The fluorescence spectrum consists exclusively of at. lines, whereas the absorption contains in addition a band system. The existence in the vapour of In_2 mols. is established.

L. G. G.

Absorption of light in caesium vapour in the presence of foreign gases. R. W. DITCHBURN and J. HARDING (Proc. Roy. Soc., 1936, A, 157, 66-79; cf. A., 1935, 907).—The absorption of Cs vapour in the presence of Ne, Ar, Kr, Xe, N_2 , H_2 , D_2 , and C_6H_6 has been measured. All gases cause a reduction in the amount of absorption. The shape of the absorption curve undergoes a change near the series-limit, the max. absorption being shifted to shorter λ and the slope of the curve becoming less.

L. L. B.

Excitation of light by collision between caesium ions and helium atoms. W. MAURER (Z. Physik, 1936, 104, 113-121).—A method previously given (A., 1936, 1167) is used to study the influence of current and pressure on the intensity of Cs and He lines obtained as a result of $\text{Cs}^+ \rightarrow \text{He}$ collisions.

L. G. G.

Structure of the band spectrum of mercury vapour. II. S. MROZOWSKI (Z. Physik, 1937, 104, 228-247).—A consideration and extension of previous work (A., 1934, 232).

L. G. G.

Spectra of high-frequency discharges in mercury vapour. II. Comparison of electrodeless with external electrode excitation. III. Modification due to wave-length. J. K. ROBERTSON and R. H. HAY (Canad. J. Res., 1936, 14, A, 201-208).—Comparison has been made of the spectra of Hg vapour excited by electrodeless discharge and by external electrode discharge at 100-250° and at λ 5, 35, 75, and 200 m. Excepting for the highest frequency, external electrode excitation was more efficient for the emission of arc and spark lines. At a low v.p., a very brilliant discharge free from spark

lines is obtained at 5 m. The results are discussed theoretically.

J. W. S.

Excitation of mercury by collision with slow positive mercury ions. H. MOSER (Ann. Physik, 1937, [v], 28, 97-103).—The variation in intensity of the 2537 and 3125 Hg lines with the velocity of the exciting Hg was determined up to 5000 volts. The excitation function is different from that for excitation by electrons. The resonance line λ 2537 is particularly strong in the ionically excited spectrum. Investigation of the intensity distribution of singlet and triplet lines shows that the latter are more strongly excited than the former by exciting ions of low velocity, but that this is reversed for higher velocities.

A. J. M.

Sparking potential of mercury vapour. F. L. JONES and W. R. GALLOWAY (Nature, 1936, 138, 973).—Over a wide range of v.d., the sparking potential is a linear function of pressure \times distance between the electrodes from approx. 500 to 5000 volts. Min. sparking potentials for cathode surfaces of Ni, "stay-brite" steel, and Ni or steel coated with Hg are recorded and the process of formation of ions is discussed.

L. S. T.

Spectral energy distribution and light efficiency of the discharge in mercury vapour at high pressures. H. KREFFT, K. LARCHE, and F. RÖSSLER (Physikal. Z., 1936, 37, 800-803).—The energy distribution and light efficiency of the discharge in Hg vapour were determined at pressures up to 30 atm. The light efficiency of lines λ 5770 and 5790 increases more slowly with pressure than the 5461 line. For the first term of the triplet subsidiary series, the efficiency increases with increasing pressure steadily up to 30 atm., but for higher terms a decrease occurs before this pressure is reached, the decrease commencing at a lower pressure the higher is the term. The lines are considerably broadened on the side of longer λ at higher pressures, and a continuous background is produced extending from the Schumann region into the visible. Self-absorption has a great effect on the spectral energy distribution.

A. J. M.

Zeeman phenomenon. É. SEVIN (Compt. rend., 1936, 203, 1147-1149).—Two solutions of the Schrödinger equation, allowing for at. spin, correspond with normal and abnormal Zeeman effects.

A. J. E. W.

Paschen-Back effect: $^2S^2P$ multiplets in strong fields. J. B. GREEN and R. A. LORING (Physical Rev., 1936, [ii], 50, 975; cf. A., 1936, 653).—Jacquinot's letter (cf. *ibid.*, 1310) reports 44,000 gauss as against 4400 gauss in his original paper.

N. M. B.

Potential gradient in negative dark space of normal glow discharge. W. H. ERNST (Helv. phys. Acta, 1935, 8, 381-404; Chem. Zentr., 1936, i, 1377).—Probe measurements in the Faraday dark space, negative glow, and Crookes dark space of H and A glow discharges show no cathodic space charge sheath to exist. The potential fall follows the theory of Compton and Morse (Physical Rev., 1927, [ii], 30, 305).

J. S. A.

Investigation of electrical discharges in gases with the cloud chamber. E. FLEGLER and R.

RAETHER (Z. Physik, 1937, 104, 219—220).—A reply to criticism (cf. A., 1936, 770). L. G. G.

Spark discharge with alternating voltage. Spark discharge with pulsating illumination. W. FUCHS (Z. Physik, 1936, 103, 709—727).—The Townsend equation has been extended to cover the case of alternating-voltage spark discharge. If the frequency is not too great, it is shown that the striking voltage is increased (e.g., 10% at 5280 cycles per sec.). The striking voltage with intermittent illumination of the cathode is independent of the frequency of the pulsations. A. E. M.

"Tube" discharges. G. ZIMMERMANN (Z. Physik, 1937, 104, 309—334).—A study of the "tube" discharge in HCl gas from which are derived expressions for the distribution of the charge carriers, and their relation to the diameter of the tubes. L. G. G.

Increase of spark potential by irradiation. R. SCHADE (Naturwiss., 1936, 24, 813).—The increase of spark potential on irradiation in a homogeneous field at low pressures observed by Seitz *et al.* (A., 1936, 770) could not be confirmed. A decrease was observed with Ne and A, the lowering being the greater the more intense was the radiation. The discrepancy between the results is probably due to avoidance of impurities (particularly grease) on the electrodes in the present work. A. J. M.

Red and sunlit auroras and the state of the upper atmosphere. L. VEGARD (Nature, 1936, 138, 930—931). L. S. T.

Stellar atmospheres. A. UNSOLD (Physikal. Z., 1936, 37, 792—797).—The physical foundations of a quant. theory of the Fraunhofer lines, including the thermal Doppler effect, radiation damping, collision damping, pressure effect, and rotation of the star, are considered. Examination of the intensity of Fraunhofer lines in the light of the theory enables conclusions to be reached concerning the constitution of stellar atm. A. J. M.

Spectrum of Nova Lacertae. H. CAMICHEL (Compt. rend., 1936, 203, 1130—1132).—Absorption and emission lines in the range 4850—6600 Å. are given for the two phases of the Nova. A. J. E. W.

Accuracy of calibration of X-ray doses. H. BEHNKEN (Physikal. Z., 1936, 37, 878—881).—Abs. determination of X-ray doses can be made in international Röntgen units with an accuracy of 0.1%. A. J. M.

Polarisation of hard X-rays. E. RODGERS (Physical Rev., 1936, [ii], 50, 875—878).—X-Rays scattered at 90° from the primary beam were again scattered at 90° and relative intensities of the tertiary rays parallel and perpendicular to the primary rays were determined with a Geiger-Müller counter. At 80 kv. polarisation was almost complete, but decreased to 69.6% at 800 kv. Results are in general agreement with Nishina's theory. N. M. B.

Scattering of X-rays by a spinning electron. A. H. COMPTON (Physical Rev., 1936, [ii], 50, 878—881).—Mathematical. A theory based on classical electrodynamics is presented. N. M. B.

Characteristics of the Compton modified band. P. KIRKPATRICK, P. A. ROSS, and H. O. RITLAND (Physical Rev., 1936, [ii], 50, 928—935; cf. A., 1934, 1282).—The shapes of Compton modified bands, calc. for all scattering elements from H to A, vary periodically with at. no. Breadths of observed modified bands exceed calc. breadths by 75% for C scatterers and 140% for Be. The intensity of modified to unmodified radiation from graphite scatterers agrees, within 10% with predictions based on the Wentzel-Waller theory of scattering by bound electrons over 435—710 X, and scattering angles 27—139°. A still smaller shift of the max. in the modified band than that given by the Compton equation is indicated. N. M. B.

Coincidence in time in Compton scattering. B. HOFFMANN, A. G. SHENSTONE, and L. A. TURNER (Physical Rev., 1936, [ii], 50, 1092).—In the use of a photon counter, the possibility of a time-lag between the arrival of a photon and the ejection of a scattered electron is discussed. N. M. B.

Interference from lattice sources on excitation by X-rays. G. BORRMANN (Ann. Physik, 1936, [v], 27, 669—693; cf. A., 1935, 1193).—Interference patterns have been observed due to multiple reflexions of the secondary radiation excited by X-rays in single crystals of Cu, magnetite, Fe pyrites, strontianite, Zn blende, and KBr. The intensity of the interference patterns decreases in this order. Results are in agreement with the theory of Laue (*ibid.*, 1306) and differ from those obtained by excitation with electrons on account of the deeper penetration of X-rays into the crystal. All lines appear bright for angle of emergence <17° to the crystal surface. At larger angles lines may be bright, or dark, or show a bright-dark structure. Qual. explanations of these appearances are given. O. D. S.

Fine structure of the emission of a copper single-crystal anticathode. H. VOGES (Ann. Physik, 1936, [v], 27, 694—720; cf. A., 1935, 1306).—All the interference lines calc. from the theory of Laue have been observed. The measured breadth of dark lines is > that calc. without allowance for the breadth of the focal spot, but follows a similar curve with increasing Bragg angle. At an angle of emergence <6° to the crystal surface all lines appear bright. At greater angles all lines show an intermediate region of bright-dark structure. Theoretical explanations of the structure of the lines are given. It is deduced that X-rays are coherent over an angle of 144°. O. D. S.

Effects of chemical combination with oxygen and fluorine on the doublet of some of the lighter elements [Ne to Cl]. N. G. JOHNSON (Nature, 1936, 138, 1056—1057; cf. A., 1936, 1311).—The displacement in the $K\alpha_{1,2}$ doublet which occurs appears to increase as the square of the max. valency of the combining element. L. S. T.

$K\alpha$ Satellite lines for elements Zn (30) to Pd (46). C. H. SHAW and L. G. PARRATT (Physical Rev., 1936, [ii], 50, 1006—1012).—Investigations previously reported (cf. A., 1936, 1041) are extended to Zn (30)—Pb (46). In the 4 group, components

α' , α_3 , α_4 , and α_3' are found for Zn and As, α_3 , α_4 , and α_3' for Se, Br, Sr, and Zr, and α_4 and α_3' for Nb, Mo, and Pd. Data for λ , relative intensity, and line width at half-max. intensity for each component are given.

N. M. B.

X-Ray spark lines. F. WISSHAK (Ann. Physik, 1937, [v], 28, 71—86).—The intensity of X-ray spark lines, or satellites, has been investigated with the lines of Cu, the variation of relative intensity with potential being determined. The relative intensity is practically const. for potentials between 19 and 48 kv. The excitation potential of the lines is 11 ± 1.5 kv.

A. J. M.

Influence of chemical combination on the form of the $L\alpha$ line of copper and nickel. E. SAUR (Z. Physik, 1936, 103, 421—433).—With a high-vac. crystal spectrograph and microphotometer the $L\alpha$ line of Cu and Ni and of some of their alloys and compounds was examined. The half-width val. of the Cu $L\alpha$ line showed variations with mode of combination up to 14%, but the line components showed no changes of position. Variations were negligible in the case of Ni.

A. E. M.

X-Ray levels and atomic constants. II. H. R. ROBINSON (Phil. Mag., 1936, [vii], 22, 1129—1136; cf. A., 1935, 139).—Results obtained for h/e by various methods are compared. The magnetic spectrometer gives $e/m_0 \times e/h \times \rho = 1.277_4 \times 10^{24}$ in the usual mixed units (ρ = ratio of true to conventional Moseley-Siegbahn λ of X-radiation). Using the most trustworthy vals. for e/m_0 and ρ , this gives 1.379×10^{-17} for h/e , agreeing well with the val. obtained from the Rydberg const., but less well with those obtained from the inverse photo-electric effect (Kirkpatrick *et al.*, A., 1934, 586).

A. J. M.

Cooling of a surface by photo-electric emission. H. M. ZENOR (Physical Rev., 1936, [ii], 50, 1050—1053).—The cooling of a thin Cs surface deposited on Pt, when photo-electrons flowed from the surface, was measured by a Fe-Ni thermocouple. The energy loss agreed approx. with theory.

N. M. B.

Relationship between corpuscular and thermal oscillations in electron tubes. W. SCHOTTKY (Z. Physik, 1937, 104, 248—274).—A description of work in this field and theoretical discussion.

L. G. G.

Emission of negative electricity by glowing platinum in chlorine. S. KALANDYK (Z. Physik, 1936, 103, 583—597).—At a pressure of 0.01 mm. Hg, below 1200°, Cl_2 greatly increases the negative emission from Pt, but not the energy of emission. An active layer is formed which evaporates above 1200°. For 1.5 mm. Hg, below 900°, the energy of emergence of electrons is about 1 volt, but above 1000° is comparable with Pt in vac. (6 volts).

A. E. M.

Experiments on the theory of electron emission under the influence of strong fields. (A) E. W. MÜLLER. (B) W. SCHOTTKY (Physikal. Z., 1936, 37, 838—841, 841—842).—(A) It has been shown experimentally, in agreement with theory, that no cooling of the cathode occurs when electrons are emitted from it under the action of a powerful field. The energy distribution of the field electrons was deter-

mined; it indicates that electrons leave the cathode without the necessity of exceeding a potential threshold. The effect of the emission work (ϕ) on the field current is $>$ that required by the wave-mechanical theory of penetration of a potential barrier. For Ba and Mg layers a ϕ^3 instead of a $\phi^{1/2}$ law is followed.

(B) A discussion of the above results from the viewpoint of wave-mechanics.

A. J. M.

Anomalous charging phenomena for very slow positive rays. F. WOLF (Physikal. Z., 1936, 37, 854—855).—Investigation of numerous collision processes between H_2 , N_2 , He, Ne, and A and their ions indicates that for slow rays the charging cross-section with respect to ions shows a type of Ramsauer effect.

A. J. M.

Absolute values of the electron drift velocity in nitrogen, helium, neon, and argon. R. A. NIELSEN (Physical Rev., 1936, [ii], 50, 950—954).—The vals. obtained experimentally by the electrical shutter method (cf. A., 1936, 540) show a discrepancy from calc. vals., and in every case the deviation is explained on the view that the distribution of electron velocities is such that occasional inelastic collisions occur. Assuming these, a val. for the probability of excitation of electronic levels in He, Ne, and A is calc.

N. M. B.

Mass-spectrographic examination of negative ions in gas discharges at higher pressures. O. TUXEN (Z. Physik, 1936, 103, 463—484).—The negative charge carriers in gas discharges are examined mass-spectrographically at pressures between 0.5 and 10 mm. Hg, by acceleration through a perforated anode. In air, besides electrons, O^- , and O_2^- , are found NO_2^- and NO_3^- , in H_2 only H^- , and in the inert gases no negative ions.

L. G. G.

Measurement of velocity and energy distributions. R. KOLLATH (Ann. Physik, 1936, [v], 27, 721—741).—Methods used in the deduction from experimental data of the velocity and energy distributions in beams of charged particles are criticised and found to be in error in many cases. The methods of measurement by retarding electric field, transverse magnetic field, and transverse electric field are treated in detail. Important alterations in published data result from the corrections applied.

O. D. S.

Determination of at. wts. by means of the micro-balance, and the values obtained for carbon, nitrogen, and fluorine. W. CAWOOD and H. S. PATTERSON (Phil. Trans., 1936, A, 236, 77—102; cf. A., 1935, 425).—The theory of the quartz micro-balance is discussed and a description is given of an improved accurate instrument in which the beam is suspended on quartz fibres. Adsorption was compensated by adjusting the instrument to give the accepted val. for the mol. wt. of SO_2 , and errors due to inadequate temp. control, refraction in manometer wall, change in centre of gravity of closed bulb with pressure, etc. were also removed. It was shown that pv is a linear function of p at pressures of 1—3 m. The prep. of pure gases is described. The mol. and at. wts. ($\text{O} = 16.0000$) are: N_2O 44.0135, $\text{N} = 14.007$; CO_2 44.0101 \pm 0.0020, $\text{C} = 12.010_1 \pm 0.0020$; C_2H_4 28.0556 \pm 0.00087, $\text{C} = 12.0122 \pm 0.0004$; CF_4 87.9894, $\text{F} = 18.995$

if $C = 12.011$; $MeF\ 34.0318$, $F = 18.997$ if $C = 12.011$. Compressibilities deduced from micro-balance results are in agreement with vals. obtained with Andrew's apparatus. If an at. wt. 1.0081 (from mass spectrograph) be used for H instead of 1.0078, the at. wt. of C obtained from $C_2H_4 = 12.0116$, in better agreement with the val. from CO_2 , and F from $MeF = 18.996$. The results are compared with those of other workers.

R. S. B.

Difference in at. wt. of oxygen from air and water. E. R. SMITH and H. MATHESON (J. Res. Nat. Bur. Stand., 1936, 17, 625—628).—The density of H_2O formed by combustion of electrolytic H_2 in air, brought to the same H-isotopic composition as ordinary H_2O , is 8.6 p.p.m. > that of ordinary H_2O . The difference is also obtained between H_2O formed by recombining electrolytic H_2 and O_2 and H_2O formed by burning electrolytic H_2 in air, and corresponds with a difference of 0.0001 at. wt. unit between the at. wts. of atm. and aq. O_2 .

J. W. S.

Relative at. wts. of oxygen in water and air.

II. **Relative at. wt. of oxygen in fresh water, salt water, and atmospheric water vapour.** M. DOLE (J. Chem. Physics, 1936, 4, 778—780).—Purified Lake Michigan H_2O appears to be nearly exactly intermediate in density between purified Atlantic Ocean H_2O and H_2O condensed from the atm., the difference being due to differences in the ratios of the O isotopes. The bearing of these results on theories explaining the relatively large concn. of ^{18}O in the atm. is discussed.

W. R. A.

Molar ratios $CO_2 : O_2$ and $N_2O : O_2$. Revision of the at. wt. of carbon and nitrogen. E. MOLES and (SENORITA) T. TORAL (Monatsh., 1936, 69, 342—362).—The method of limiting densities furnishes the most exact vals. for the mol. and at. wt. of gases. At. wts. calc. from the molar ratios $CO_2 : O_2$ and $N_2O : O_2$ are 12.007 ± 0.0005 and $14.008(3) \pm 0.0005$ for C and N, respectively. The slightly higher vals. obtained with the micro-balance are attributed to adsorption.

R. S.

Revision of the at. wt. of arsenic. II. Synthesis and analysis of arsenic tribromide. J. H. KŘEPELKA and M. KOČNAR (Coll. Czech. Chem. Comm., 1936, 8, 485—495).—The synthesis of $AsBr_3$ from pure As and Br is described. From determinations of the ratios $AsBr_3 : 3Ag$ and $AsBr_3 : 3AgBr$, the at. wt. of As is 74.923 (Ag 107.880, Br 79.916) in better agreement with Aston's val. than is the International val.

J. G. A. G.

At. wt. of iodine. E. MOLES (Coll. Czech. Chem. Comm., 1936, 8, 479—484).—Discrepancies between the accepted at. wt. of I and the vals. derived from the ratios $I_2O_5 : 2Ag$ (A., 1909, ii, 225) and $I_2 : I_2O_5$ (A., 1931, 543) are removed by using, in the *d* correction, the recently determined $d_{415}^{25} 5.278$ of I_2O_5 in place of the lower val. previously accepted. The at. wt. of I is 126.917 ± 0.001 .

J. G. A. G.

Double-focussing mass spectrograph and the masses of ^{15}N and ^{18}O . J. MATTAUOH (Physical Rev., 1936, [ii], 50, 1089; cf. A., 1936, 1440).—A correction.

N. M. B.

Mass-spectrographic study of the isotopes of argon, potassium, rubidium, zinc, and cad-

mium. A. O. NIER (Physical Rev., 1936, [ii], 50, 1041—1045).—A detailed account of investigations previously reported (cf. A., 1936, 401), with the addition of results for Cd. Isotopes and % abundances for Cd are: 116 (7.3), 114 (28.0), 113 (12.3), 112 (24.2), 111 (13.0), 110 (12.8), 108 (1.0), 106 (1.4). Calculations indicate that the radioactivity of K and Rb is due to the decay of ^{40}K and ^{87}Rb , respectively.

N. M. B.

Isotopy of radio-iodine ^{128}I and ordinary iodine ^{127}I . M. GUILLOT and B. GOLDSCHMIDT (Bull. Soc. chim., 1936, [v], 3, 2371—2374).— ^{128}I , obtained from EtI containing free I by the method of Szilard and Chalmers (A., 1934, 1152), is converted, together with the added I, into PbI_2 . When the latter is fractionally crystallised all fractions are found to have the same activity, showing that ordinary I and its irradiation product are isotopic.

F. L. U.

Second isotope of lutecium and magnetic moment and quadrupole moment of the ^{175}Lu nucleus. H. GOLLNOW (Z. Physik, 1936, 103, 443—453).—Hyperfine structure examination of Lu γ lines leads to the discovery of a hitherto unknown isotope (173 or 177) with relative abundance 1.5% and with spin $I = 7/2$ (9/2?). For the ^{175}Lu nucleus the magnetic moment is $\mu = \sim +2.6$ nuclear magnetons and the quadrupole moment $q = +5.9 \times 10^{-24}$.

A. E. M.

Natural system of the elements from the viewpoint of nuclear physics. W. DE GROOT (Chem. Weekblad, 1937, 34, 3—7).—A lecture.

S. C.

Thermal effect of rays from radioactive bodies. A. S. SANIELEVICI (J. Chim. phys., 1936, 33, 759—800).—A sensitive adiabatic non-isothermal calorimeter is described. The data refer to the disintegration of Po and members of the Ac series. Periods of half val. are confirmed and new vals. of thermal effects are recorded. The thermal method affords trustworthy vals. of the Ac content of actiniferous products.

J. G. A. G.

Columnar ionisation. W. R. KANNE and J. A. BEARDEN (Physical Rev., 1936, [ii], 50, 935—938).—The ionisation collected from single α -particles has been measured as a function of the angle between the path of the particle and the direction of the electric field for field strengths of 8, 100, and 500 volts per cm. and air pressures of 1 and 2 atm. Results agree with curves based on Jaffé's theory. For low field strengths the loss of ions by recombination is appreciable.

N. M. B.

Ionisation measurements on single α rays. W. JENTSCHKE (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 151—173; Chem. Zentr., 1936, i, 1566).—From measurements of ionisation simultaneously made at two points on the path, the ionisation curve of single α -rays from Po and Th-C' is constructed. The total ionisation of rays of equal initial velocity is variable, but is related to the range.

J. S. A.

Method of counting α -rays emitted from uranium. R. SCHIEDT (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 175—190; Chem. Zentr., 1936, i, 1566).—A valve electrometer method is described.

J. S. A.

Simple apparatus for demonstrating scattering of α -rays. R. MERCIER and P. SCHERRER (Helv. phys. Acta, 1935, 8, 589—590; Chem. Zentr., 1936, i, 1566).—The no. of α -particles incident at various scattering angles on a counter is measured.

J. S. A.

Absolute velocity of α -particles from radium-C'. G. H. BRIGGS (Proc. Roy. Soc., 1936, A, 157, 183—194).—Precision measurements of H_p for the α -particles from Ra-C' are described; the max. error is of the order of 1 in 10^4 . Using for E/M for the α -particle a val. calc. from the faraday and the at. wt. of He, the velocity (1.921×10^9 cm. per sec.) and the energy have been calc.

L. L. B.

Influence of pressure and temperature on the recombination coefficient and ionisation by γ -rays in air and carbon dioxide. W. MÄCHLER (Z. Physik, 1936, 104, 1—33).—A continuation of earlier work (A., 1936, 541) with special reference to the influence of field strength and pressure on the temp. coeff. of the ionic current.

L. G. G.

Absorption of hard γ -rays by light elements. J. C. JACOBSEN (Z. Physik, 1936, 103, 747—755).—With γ -rays from Ra-Th ($h\nu = 2.6 \times 10^6$ volts) the absorption coeff. per electron is given by $= 3.8 \times 10^{-28} \times$ at. no., in good agreement with calculations of Bethe. Photo-absorption is very small for light elements, but measurements with heavy elements agree with calc. vals.

A. E. M.

Absorption and diffusion of slow neutrons. E. AMALDI and E. FERMI (Physical Rev., 1936, [ii], 50, 899—928).—A detailed study of the absorption properties of slow neutrons establishes the existence of absorption bands which correspond with energy intervals sufficiently narrow to allow the isolation of relatively homogeneous neutron groups. Experiments and considerations to disclose the characteristics of the absorption and scattering properties of the various groups are described.

N. M. B.

Diffusion of slow neutrons. G. C. WICK (Atti R. Accad. Lincei, 1936, [vi], 23, 774—782).—Mathematical.

O. J. W.

Slowing down of neutrons in water. G. HORVAY (Physical Rev., 1936, [ii], 50, 897—898).—A simple method is given for estimating initial neutron energies from final energy and mean square distance of travel, using Fermi's expression for diffusion of neutrons in H_2O .

N. M. B.

Scattering of neutrons by protons. E. T. BOOTH and C. HURST (Nature, 1936, 138, 1011).—The mean free path found for 2.4-m.e.v. neutrons in paraffin wax is 4.6 ± 0.9 cm., corresponding with a cross-section of $1.8 \pm 0.4 \times 10^{-24}$ cm.² for 2.4-m.e.v. neutrons scattered by protons. This val., together with those found by other investigators for neutrons of different energies, is compared with the theoretical curve derived from Wigner's formula.

L. S. T.

Neutron-proton interaction: scattering of neutrons by protons. W. D. HARKINS, M. D. KAMEN, H. W. NEWSON, and D. M. GANS (Physical Rev., 1936, [ii], 50, 980—991).—The angular distribution in intensity of recoil protons has been

investigated in H_2 , C_2H_4 , and H_2S , and the divergence of available data is discussed. Present theories are shown to be inadequate.

N. M. P.

Scattering of neutrons in matter. III. L. S. ORNSTEIN (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1049—1053; cf. this vol., 5).—Mathematical.

O. D. S.

Production of spaces with high neutron concentration. H. R. VON TRAUBENBERG and H. ADAM (Naturwiss., 1936, 24, 797).—The strong back-scattering of neutrons at Fe (and weaker at Pb) observed by Mitchell *et al.* (A., 1936, 1045) has been confirmed, and the effect has been used to obtain a high concn. of neutrons in enclosed spaces with Fe or Pb walls.

A. J. M.

Atomic disintegration by particles of low energy. E. H. S. BURHOP (Proc. Camb. Phil. Soc., 1936, 32, 643—647).—A method of producing homogeneous ion beams of energies up to 20 kv. from a low-voltage arc is described. Ion currents up to 0.5 milliamp. are obtainable. The reactions ${}^3_1H + {}^2_1H \rightarrow {}^4_2He + {}^1_0n$ and ${}^3_1H + {}^3_1H \rightarrow {}^4_2He + {}^2_1He$ were detected using bombarding deuterons or protons of energies 8 and 17 kv., respectively.

A. J. E. W.

Efficiency of the D D nuclear reaction. R. DOPEL (Ann. Physik, 1937, [v], 28, 87—96).—A new type of apparatus for studying at. disintegration is described and the efficiency of the processes ${}^2_1D + {}^2_1D \rightarrow {}^3_1H + {}^1_0n$ and ${}^2_1D + {}^2_1D \rightarrow {}^3_2He + {}^1_0n$ has been re-determined between 10 and 200 kv. The val. at 100 kv. is about 10^{-9} , being considerably < the vals. obtained by other workers.

A. J. M.

Scattering of protons by protons. T. SEXL (Naturwiss., 1936, 24, 795—796).—Results of experiments on scattering of protons by protons at a const. scattering angle of 45° are compared with theory (A., 1936, 774).

A. J. M.

Negative proton and some artificial radioactivities. R. J. WALEN and M. E. NAHMIA (Compt. rend., 1936, 203, 1149—1151).—The reactions ${}^{10}_5B + {}^1_0n \rightarrow {}^{10}_4Be + {}^{-1}_1p$ and ${}^{24}_{12}Mg + {}^1_0n \rightarrow {}^{24}_{11}Na + {}^{-1}_1p$ (${}^{-1}_1p =$ "negative proton") could not be detected. Neutron bombardment of B induces activity of period 1 sec.; probably ${}^{10}_5B + {}^1_0n \rightarrow {}^{10}_4Be + {}^3_4Li + {}^3_4He$. A period of 0.75 sec. was also observed in Li, involving neutron capture.

A. J. E. W.

Disintegration of nitrogen by slow neutrons. W. E. BURCHAM and M. GOLDBABER (Proc. Camb. Phil. Soc., 1936, 32, 632—636).—A method of distinguishing the emission of α -particles and protons, using photographic emulsions of different sensitivity, shows the reaction to be ${}^{14}_7N + {}^1_0n \rightarrow {}^{14}_6C + {}^1_1H$. The cross-section is approx. 10^{-24} sq. cm.

A. J. E. W.

Transmutation of potassium, chlorine, and phosphorus by Th-C' α -particles. E. POLLARD and C. J. BRASEFIELD (Physical Rev., 1936, [ii], 50, 890—894; cf. May, A., 1936, 1173).—Observation of the energy distribution of emitted protons shows that these occur in groups corresponding with discrete vals. of the nuclear energy changes. Similarity of behaviour for the three ($4n + 3$) type elements is found; each gives groups with average energy change difference

1.5 m.e.v. The vals. 33.9799 ± 0.0015 and 37.9753 ± 0.0016 are deduced for the masses of ^{34}S and ^{38}A , respectively.

N. M. B.

Period of radioactive phosphorus ^{32}P . G. J. SZOO and C. P. KOENE (*Physica*, 1936, 3, 1053—1056).—A method for the relative measurement of weak activities, eliminating "background ionisation" corrections, is described. The period of ^{32}P is 15.0 ± 0.1 days.

A. J. E. W.

Radiations emitted from artificially produced radioactive substances. II. γ -Rays from several elements. J. R. RICHARDSON and F. N. D. KURIE (*Physical Rev.*, 1936, [ii], 50, 999—1006; cf. A., 1936, 542).—Depending on the measurement of the momentum distribution of the Compton recoil electrons from thin mica in a cloud chamber traversed by a magnetic field, a method for measuring energy and relative intensity of γ -rays from light elements in the energy range 0.5—5 m.e.v. is discussed. The radiation from ^{41}A appears to be monochromatic and of energy 1.37 m.e.v.; ^{24}Na emits lines at 0.95, 1.93, and 3.08 m.e.v.; the two quanta annihilation radiation from the positrons of ^{13}N corresponds with 0.51 m.e.v. Results are in agreement with theory.

N. M. B.

Artificial radioactivity of copper, a branch reaction. S. N. VAN VOORHIS (*Physical Rev.*, 1936, [ii], 50, 895—897; cf. Lawrence, A., 1935, 1296).—The radioactive product of longer half-life produced in Cu by deuteron bombardment emits electrons and positrons in the ratio 1.6 to 1. The half-life is 12.8 ± 0.1 hr. The excitation curve of positrons and electrons for deuterons of different energies agrees with Oppenheimer's theoretical expression (cf. *ibid.*, 1296). The upper limits of the energy distribution of the positrons and electrons, as found by cloud chamber photographs, are 0.79 and 0.83 m.e.v., respectively, indicating that the activity is due to ^{64}Cu which branches in disintegrating, going either to Zn or Ni.

N. M. B.

Nuclear reactions. S. WESTIN (*Tids. Kjem.*, 1936, 16, 151—155).—A lecture.

M. H. M. A.

Constitution of matter and artificial radioactivity. F. JOLIOF (*Bull. Acad. Sci. U.R.S.S.*, 1936, 613—628).—A lecture.

Heavy particle component of the cosmic radiation. C. G. MONTGOMERY and D. D. MONTGOMERY (*Physical Rev.*, 1936, [ii], 50, 975—976; cf. A., 1936, 1315).—The results of Brode (cf. *ibid.*, 1441) are examined on the theory developed by Swann (cf. *ibid.*, 542).

N. M. B.

Cosmic-ray shower production and absorption in various materials. J. E. MORGAN and W. M. NIELSEN (*Physical Rev.*, 1936, [ii], 50, 882—889).—Measurements of shower production in thin pieces of C, Al, Cu, Sn, and Pb indicate that the increase in counting rate associated with each atom in the producing material \propto the 2.0 ± 0.2 power of the at. no. *Z* of the element concerned, and for heavy elements increases faster than the first power of the thickness of the producing material. Absorption per atom of showers from Pb, in Pb, Sn, Cu, Al, and C varies over

Z^{1-2} . Rossi transition curves for Pb, Fe, and Al are given.

N. M. B.

Precision cosmic-ray measurements up to within 1—2% of the top of the atmosphere. R. A. MILLIKAN, H. V. NEHER, and S. K. HAYNES (*Physical Rev.*, 1936, [ii], 50, 992—998, 1191).—The ionisation in self-recording electroscopes sent by balloon into the stratosphere shows a max. at 47.6 mm. atm. pressure and falls 22% at 12.9 mm. pressure (92,000 ft., or 98.3% atm. altitude). Results indicate that atm. cosmic-ray ionisation is not appreciably due to incoming protons, and that the Oppenheimer-Bethe-Heitler law of nuclear absorption is not valid for incoming electrons of a few billion e.v. energy.

N. M. B.

Atom nucleus problem. I. E. TAMM (*Bull. Acad. Sci. U.R.S.S.*, 1936, 301—323).—A lecture.

J. J. B.

Nuclear physics. S. FLÜGGE and A. KREBS (*Physikal. Z.*, 1937, 38, 13—36).—A summary.

Fock equations for complex configurations. G. H. SHORTLEY (*Physical Rev.*, 1936, [ii], 50, 1072—1075; cf. Brown, A., 1933, 996).—Mathematical.

N. M. B.

Atomic wave functions for two stages of ionisation of silicon. H. L. DONLEY (*Physical Rev.*, 1936, [ii], 50, 1012—1016).—Full data calc. by the self-consistent field method are tabulated for Si^{+2} and Si^{+3} .

N. M. B.

Properties of matter at very high pressures and temperatures. F. HUND (*Physikal. Z.*, 1936, 37, 853).—The variations in the properties of matter as the pressure is increased to 10^{26} atm. and the temp. to 10^{12} are discussed.

A. J. M.

Metastable states of atomic nuclei. C. F. VON WEIZSÄCKER (*Naturwiss.*, 1936, 24, 813—814).—The theory of the "isomerism" of at. nuclei breaking up with liberation of β -rays is discussed.

A. J. M.

Regularities in the structure of atomic nuclei. H. SCHÜLER and H. KORSCHING (*Naturwiss.*, 1936, 24, 796—797; cf. A., 1936, 1316).—Comparison of mechanical and magnetic moments of isotopes of elements which have only two isotopes (elements containing an odd no. of protons besides paired neutrons) makes it possible to discover how the at. nucleus changes when two neutrons are introduced. This brings about no change in the mechanical moment, but for some nuclei (Ga, Eu) the magnetic moment is considerably increased, whilst for others (Cu, Re, Tl) there is little change. In the latter case the magnetic moment is greater for the heavier nucleus, and the relative increase is equal to the relative increase in mass of the nucleus.

A. J. M.

Bothe-Geiger experiment. W. E. BURCHAM and W. B. LEWIS (*Proc. Camb. Phil. Soc.*, 1936, 32, 637—642; cf. A., 1925, ii, 1).—Coincident emission of electrons and photons during scattering of X-rays by a 50% H_2 -He mixture has been shown, using counters enclosing a large solid angle, and an electrical method for recording coincidences.

A. J. E. W.

Fermi's theory of β -decay. E. GORA (*Proc. Indian Acad. Sci.*, 1936, 4, A, 551—554).—Theoretical.

R. S.

Theory of the β -transformation and nuclear forces. I. G. WENTZEL (Z. Physik, 1936, 104, 34—47).—Mathematical. L. G. G.

Impossibility of a neutrino theory of light. V. FOCK (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 229—231).—It is shown that any neutrino theory of light is incompatible with the superposition principle. The theory of Jordan is criticised. O. D. S.

Relativistically invariant formulation of the neutrino theory of light. R. DE L. KRONIG (Physica, 1936, 3, 1120—1132).—Mathematical. A. J. E. W.

Binding of neutrons and protons. J. B. FISK, L. I. SCHIFF, and W. SHOCKLEY (Physical Rev., 1936, [ii], 50, 1090—1091, 1191; cf. this vol., 6; Present, A., 1935, 1442).—Mathematical. N. M. B.

Nuclear radius and many-body problem. H. A. BETHE (Physical Rev., 1936, [ii], 50, 977—979).—Mathematical. Radioactive α -decay as a many-body problem gives 13×10^{-13} cm. $\pm 10\%$ for the nuclear radius, agreeing with the experimental cross-section for the disintegration of heavy nuclei by deuterons. N. M. B.

Geometrical theory of matter. G. FOURNIER (Compt. rend., 1936, 203, 1138—1140).—At. nuclei are supposed built up of octahedral and tetrahedral units, corresponding with He nuclei, and protons or neutrons, respectively. A. J. E. W.

Polarisation effects in quartz spectrographs. G. BOLLA (Z. Physik, 1936, 103, 756—767).—Quartz spectrography of continuous spectra with a Glan-Foucault prism between the light source and slit is shown to give an alternating fluctuation in intensity in the resultant spectrogram. This phenomenon is discussed with reference to the components of the spectrograph. L. G. G.

Spectral absorption of neodymium glasses. F. WEIDERT (Oesterr. Chem.-Ztg., 1936, 39, 187).—Changes in absorption spectra of glasses of const. Nd content are related to the variations in composition of the glass. Interference with the normal Nd absorption is greatest for cations of small radius, i.e., development of the full absorption spectrum occurs progressively on replacement of Li_2O by Na_2O by K_2O etc. J. S. A.

Equilibrium $2\text{H}_2 + \text{O}_2 \rightleftharpoons 2\text{H}_2\text{O}$ in the glow discharge. A. GUNTHER-SCHULZE and H. SOHNITZER (Z. Physik, 1936, 103, 627—632).—A glow discharge in H_2O vapour causes decomp. to H_2 and O_2 . The cathodic portion of the discharge appears to act as a catalyst of which the apparent temp. rises from 1900° abs. to 2800° abs. as the pressure of H_2O vapour increases from 0.04 to 20.0 mm. Hg. H. C. G.

Intensities in the $^3\Pi, ^3\Sigma$ band of PH. P. NOLAN and F. A. JENKINS (Physical Rev., 1936, [ii], 50, 943—949).—Measurements of relative intensities of the lines in the (0, 0) band of PH at λ 3400, excited by a high-voltage discharge through H_2 and P vapour, are given. The distribution of mols. in the initial states, evaluated by the sum rule, corresponds with

thermal equilibrium at 696° abs. Calc. and experimental intensity factors are tabulated and discussed. N. M. B.

Band spectrum of gold hydride. T. HEIMER (Z. Physik, 1937, 104, 303—308).—From an analysis of the arc emission spectrum of AuH, at a dispersion of 1.95 Å. per mm., new vibration levels have been assigned to the $^1\Sigma^* - ^1\Sigma$ band system. L. G. G.

Band spectrum of bismuth deuteride. A. HEIMER (Z. Physik, 1936, 103, 621—626).—The band system $^1\Sigma^* - ^1\Sigma$ has been obtained and analysed. Three nuclear vibration levels have been determined, both for initial and final states, and dissociation vals. are given. A. E. M.

Calculation of the ultra-violet absorption frequencies of the alkali halides. T. NEUGEBAUER (Z. Physik, 1937, 104, 207—218).—Mathematical. The energies of the absorption frequencies are calc. L. G. G.

Spectrum of calcium oxide. P. H. BRODERSEN (Z. Physik, 1936, 104, 135—156).—The band spectrum of CaO in the region 3700—4900 Å. has been photographed by means of a hollow cathode at a dispersion of 0.2 mm. per Å. The consts. of the electron terms and the energy levels of the dissociation products are derived and discussed. L. G. G.

Spectra of SeO and SeO_2 . R. K. ASUNDI, M. JAN-KHAN, and R. SAMUEL (Proc. Roy. Soc., 1936, A, 157, 28—49; cf. A., 1935, 1188).—Analyses have been made of the emission spectrum of SeO and the absorption spectrum of SeO_2 . The energies of excitation and the energies of the SeO linkings are almost equal in the two mols. The frequency of the symmetric valency vibration of SeO_2 is nearly identical with the vibrational frequency of SeO, both in the normal and excited states. The results indicate strong localisation of the SeO linkings in SeO_2 . L. L. B.

Absorption and emission spectra of ions of the rare-earths in the solid state. H. GOBRECHT (Physikal. Z., 1936, 37, 851—852).—A study of the infra-red spectra of some rare-earth salts, particularly salts of Eu^{+++} , shows that there are certain transitions for which it is possible to observe the Stark separation brought about by the field of the crystal. A. J. M.

Emission spectra of free radicals produced by photo-dissociation of polyatomic molecules in the Schumann ultra-violet. H. NEUJMIN and A. TEREIN (Acta Physicochim. U.R.S.S., 1936, 5, 465—490).—Excited radicals formed during photo-dissociation are I from I_2 ; OH from H_2O , MeOH, EtOH, HCO_2H , and AcOH; CN from MeCN; NH_2 from NH_3 and N_2H_4 . In the case of HCO_2H there is some evidence of the formation of HCO. The relative quenching efficiencies of CO, H_2 , N_2 , and A for OH are 1.0, 0.2, 0.04, and 0.01. The high activity of CO or H_2 towards OH is attributed to a redistribution of the electronic energy in one of the pairs leading to degradation of energy without, however, the completion of a chemical reaction. The rotational structure of the OH band is completely changed by H, and He, though He shows no quenching action.

The emissions due to CN and NH_2 are quenched by N_2 and, in the case of NH_2 , by H_2 and A. C. R. H.

Band displacement as a consequence of intermolecular forces. G. KORRUM (Naturwiss., 1936, 24, 780—781).—The displacement of absorption bands on dissolution of substances producing ions has been investigated for the picrate and 2:4-dinitrophenoxide ions in H_2O , EtOH, and H_2O -EtOH. In passing from solutions in H_2O to those in EtOH there is not a simple variation of band displacement. In 40% EtOH the band does not lie between those of the two pure components. If an EtOH solution containing the above ions is added to H_2O the band is first displaced towards the red, but at a definite $[\text{H}_2\text{O}]$ a displacement towards the violet occurs. This inversion is not found in the dielectric const.-composition curve of EtOH- H_2O : it is concluded that the band displacement is not necessarily connected with dipole moment. This is supported by the effect of temp. on band displacement in different solvents. A. J. M.

Ultra-violet absorption spectra of simple hydrocarbons. I. Δ^7 -*n*-Heptene and tetramethylethylene. (Miss) E. P. CARR and (Miss) M. K. WALKER. II. In liquid and solid solution phase. (Miss) E. P. CARR and (Miss) G. P. WALTER. III. In vapour phase in the Schumann region. (Miss) E. P. CARR and (Miss) H. STUCKLEN (J. Chem. Physics, 1936, 4, 751—755, 756—760, 760—768).—I. The ultra-violet absorption spectra of Δ^7 -*n*-heptene and $(\text{CMe}_2)_2$ have been measured in liquid and hexane solution phases between 4000 and 2100 Å. and in the vapour phase between 2300 and 1500 Å. As the H in C_2H_4 are replaced by alkyl there is a progressive shift of the absorption bands in the Schumann region towards the visible. Comparison with recorded data reveals a parallelism between the spectra of different hydrocarbons having the same configuration with respect to the double linking.

II. Mol. extinction coeffs. of 12 olefine hydrocarbons have been determined between 3300 and 2100 Å. The beginning of the absorption curve is characteristic of the no. of alkyls bound to the C of the double linking and is only slightly affected by the nature of the alkyl.

III. Absorption spectra measurements between 2300 and 1500 Å. were made for 4 butenes, 5 pentenes, 1 hexene, 2 heptenes, and 2 octenes. For the spectra of all ethylenic derivatives certain general relationships exist, viz., the no. of alkyls bound to the C of the $\text{C}'\text{C}$ groups determines the wave no. of the first absorption band; a progressive shift towards the visible occurs when increasing no. of alkyls are added, but the nature of the alkyl has practically no influence on the position of the first band; where two alkyls are bound to the same C (unsymmetrical substitution) or to different C (symmetrical substitution) the wave no. of the first band is only slightly altered. The bands are analysed and discussed. W. R. A.

Chemical warfare materials. II. Absorption of light in relation to chemical constitution. III. Spectroscopic identification. H. MOHLER and J. PÖLYA (Helv. Chim. Acta, 1936, 19, 1222—1239, 1239—1242; cf. A., 1936, 545).—II. Absorption

spectra of pure COMe , $\text{COMe}\cdot\text{CH}_2\text{Br}$, $\text{COEt}\cdot\text{CH}_2\text{Br}$, COPhMe , $\text{COPh}\cdot\text{CH}_2\text{Cl}$, $\text{COPh}\cdot\text{CH}_2\text{Br}$, C_6H_5 , $\text{CH}_2\text{Ph}\cdot\text{CN}$, $\text{CH}_2\text{Ph}\cdot\text{OH}$, $\text{CHPhBr}\cdot\text{CN}$, $\text{C}_6\text{H}_5(\text{CH}_2\text{Br})_2$, CH_2PhBr , CH_2PhCl , AsCl_3 , AsEtCl_2 , lewisite I, II, and III, phenarsazine chloride, Clark I and II, Lost, EtSH , Et_2S , CS_2 , and chloropicrin, alone or in cyclohexane are detailed and discussed. Halogen, particularly Br, shifts the absorption max. towards the red and tends to obscure the fine structure of the C_6H_5 spectrum.

III. Means of identifying spectrographically Adamsite, Perstoff, and poisons mentioned above are described. R. S. C.

Absorption spectra of dihydropyridine compounds.—See A., III, 68.

Relationship between constitution and spectra of porphyrins. [Energy] level scheme for the porphyrin molecule. H. HELLSTROM (Arkiv Kemi, Min., Geol., 1936, 12, B, No. 13, 6 pp.).—The fluorescence and absorption spectra of the porphyrins are discussed on the basis of a suggested scheme of energy levels and sub-levels in both the gaseous and excited states. A detailed scheme for deuteroporphyrin is given and the λ so calc. are in good agreement with experiment (cf. Hauser *et al.*, A., 1935, 1443).

J. W. B.

Spectra of adsorbed porphyrin. F. BANDOW (Z. physikal. Chem., 1936, B, 34, 323—334; cf. A., 1936, 346, 1048).—The absorption and fluorescence spectra of porphyrins adsorbed on org. and inorg. substances have similar spectral forms to those of solutions of the porphyrins, but there are some differences in the relative intensities of the bands, which are influenced by the nature of the adsorbent and the solvent from which adsorption occurs. The fluorescence and phosphorescence spectra of various porphyrin phosphors are identical. Several complex porphyrin Zn salts have the same spectrum in after-phosphorescence and in phosphorescence during excitation as in solution. R. C.

Absorption spectra of nitroglycerin. K. MASAKI (Bull. Chem. Soc. Japan, 1936, 11, 712—715).—The absorption of nitroglycerin, pure and in EtOH solution, has been measured from 2105 to 4227 Å., and bands of some nitroparaffins are enumerated. O. D. S.

Absorption of polar crystals in the infra-red. M. BLACKMAN (Phil. Trans., 1936, A, 236, 103—131).—The theory of the vibrational spectrum of a plane lattice with one and two particles per cell, and of a cubic lattice of the NaCl type, is derived. Results agree with the infra-red spectrum of NaCl, but with KCl discrepancies occur; the origin of these is discussed. R. S. B.

Absorption spectra of saturated acyclic alcohols in the very near infra-red (6000–9500 Å.). The OH band. P. BARCHEWITZ (Compt. rend., 1936, 203, 1244—1247).—Data are given for 20 aliphatic alcohols and halides, and the position and nature of the OH bands discussed. The third harmonic of the OH band at approx. 7400 Å. is found in six alcohols at their crit. temp.

A. J. E. W.

Vibration spectra and molecular structure. I. **General. Spectrum of the OH group.** R. B. BARNES, L. G. BONNER, and E. U. CONDON (*J. Chem. Physics*, 1936, 4, 772—778).—After a brief discussion of the underlying principles in the interpretation of mol. vibration spectra in problems of mol. structure, the reasons for the appearance or non-appearance of the 3400 cm^{-1} frequency in various mols. containing the OH group are discussed. The non-appearance in the Raman spectra of certain alcohols and glycols is attributed to experimental difficulties. This frequency is absent both from the infra-red and Raman spectra of carboxylic acids and certain aromatic compounds containing OH, and the rôle of the H linking in association and chelation is discussed in connexion with these cases. W. R. A.

Infra-red absorption spectra of dioxan-water mixtures. W. GORDY (*J. Chem. Physics*, 1936, 4, 769—771).—The absorption spectra of various dioxan- H_2O mixtures have been studied between 2.5 and 6.5 μ and marked changes in the spectrum of H_2O were observed, especially at low $[\text{H}_2\text{O}]$. Association of the H_2O and dioxan is suggested as a possible explanation of the observed effects. W. R. A.

Absorption spectra of four aldehydes in the near infra-red. L. KELLNER (*Proc. Roy. Soc.*, 1936, A, 157, 100—113).—A study has been made of the absorption of EtCHO , Pr^iCHO , Bu^iCHO , and Bu^sCHO in the liquid state between 1.1 and 2.1 μ . The wave-nos. and absorption coeffs. are compared with those of previous investigators. An attempt is made to interpret the absorption frequencies as overtones and combination frequencies of some fundamental vibrations. L. L. B.

Fine structure and perturbation in the rotation-vibration spectrum of acetylene. G. W. FUNKE (*Z. Physik*, 1937, 104, 169—187).—A repetition of earlier work (A., 1936, 662) with dispersion of 1.8 Å. per mm. Two new bands are recorded at 8628 and 8640 Å., and the energy scheme is given. L. G. G.

Alleged curvilinear spreading of light rays in scattering media. M. KATALINIC (*Kolloid-Z.*, 1936, 77, 295—298).—The effect obtained by Coban (*Acta phys. Polon.*, 1935, 4, 7) is due to the formation of haloes on the photographic plate. E. S. H.

Raman investigations with glasses. R. LANGENBERG (*Ann. Physik*, 1937, [v], 28, 104—113).—New results on the Raman spectra of B, Ba, F, Al, and PO_4''' glasses are reported. The frequencies due to the lighter oxides (except alkali oxides) in the glasses could be traced, but those due to heavier oxides (BaO, PbO) and the alkali oxides are missing. BO_3''' in the glasses has a plane structure as in borates. A. J. M.

Raman spectra of light and heavy phosphine and arsine. M. DE HEMPTINNE and J. M. DELFOSSE (*Ann. Soc. Sci. Bruxelles*, 1936, 56, B, 373—383; cf. A., 1935, 1445).—The Raman spectra of PH_3 , PD_3 , AsH_3 , and AsD_3 have been measured. AsD_3 gives lines 1508, 645, and 707 cm^{-1} . The consts. of mol. vibration formulæ are calc. Anharmonic vibrations and energies of dissociation are considered. N. M. B.

Raman spectra of azoimide and carbon suboxide. W. ENGLER and K. W. F. KOHLRAUSCH (*Z. physikal. Chem.*, 1936, B, 34, 214—224).—Force consts. have been calc. from the Raman spectra, and lead to the structures $\text{O}:\text{C}:\text{C}:\text{C}:\text{O}$ (whole mol. linear) and $\text{H}:\text{N}:\text{N}:\text{N}$ (straight N chain), which also agree with the results of electron diffraction experiments. R. C.

Raman effect in electrolytes. I. **Raman spectra and electrolytic dissociation.** II. **Raman effect and the chemical bond.** H. J. BERNSTEIN, R. G. ROMANS, O. H. HOWDEN, and W. H. MARTIN (*Trans. Roy. Soc. Canada*, 1936, [iii], 30, III, 49—57, 57—64).—I. The Raman spectra of conc. aq. solutions of a no. of electrolytes have been investigated. No Raman lines were observed for the electrolytes giving monat. ions. The Raman spectra of those electrolytes which give complex ions are ascribed to complex ions. Variations in the Raman spectra of H_2SO_4 , HNO_3 , and AcOH on dilution are ascribed to changes in the degree of hydration and not to varying degrees of dissociation. No lines due to KI are observed in the Raman spectrum of a saturated solution of KI in MeOH.

II. The line due to the OH group has been observed in the Raman spectra of NaOH, MeOH, H_2O , PhOH, octoic acid, and AcOH . The sharpness and intensity of the line decrease in the above order. The OH line is absent in spectra of $\text{CCl}_3\text{CO}_2\text{H}$, H_2SO_4 , and HNO_3 . F. L. U.

Raman spectrum of deuteriosulphuric acid. A. H. LECKIE (*Trans. Faraday Soc.*, 1936, 32, 1700—1705; cf. A., 1936, 136).—Raman spectra of D_2SO_4 (from 99.6% D_2O), conc. and dil., have been determined. In the case of lines at 570 and 905 cm^{-1} there are isotope shifts in the conc. but not in the dil. acid, affording evidence that these lines are composite, one part being due to D_2SO_4 and the other to one of the ions. F. L. U.

Raman spectra of amines and methylated ammonium ions. J. T. EDSALL (*Science*, 1936, 84, 423—424).—The relation between the two sets of compounds, as revealed by their Raman spectra, is discussed. L. S. T.

Raman effect and molecular structure. I. **Structure of the guanidinium ion.** J. GUPTA (*J. Indian Chem. Soc.*, 1936, 13, 575—579).—The principal Raman line occurs at 995 cm^{-1} , whilst there are subsidiary lines at 520 and 1620 cm^{-1} . It is inferred that the NH_2 are arranged symmetrically in one plane about the C atom. R. S.

Structure of organic molecules determined by spectral methods. G. ALLARD (*Helv. Chim. Acta*, 1936, 19, 1270—1287).—The interpretation of the Raman spectra and ultra-violet absorption spectra of org. compounds is discussed theoretically. J. W. S.

Raman spectrum of deuteromethanol. S. MIZUSHIMA, Y. MORINO, and G. OKAMOTO (*Bull. Chem. Soc. Japan*, 1936, 11, 698—699).—Raman frequencies 3270—3480 and 1107 of MeOH, attributed to the vibration of H, are shifted to 2420—2560 and 955, respectively, in MeOD, whilst the frequencies associated with MeO are unchanged. R. S.

Structure of methyl and ethyl selenides. P. DONZELOT (Compt. rend., 1936, 203, 1069—1070).—Raman and infra-red absorption spectrum data are given, and vibration frequencies deduced. The Se valency angle in Me_2Se is approx. 99.3° .

A. J. E. W.

Raman effect in dibasic acids in crystalline state. B. ANAND (Proc. Indian Acad. Sci., 1936, 4, A, 603—609).—An apparatus for the study of the Raman spectra of cryst. powders is described, and the Raman spectra of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$, $\text{CH}_2(\text{CO}_2\text{H})_2$, and $(\text{CH}_2\text{CO}_2\text{H})_2$ have been determined. Possible modes of vibration, corresponding with the observed frequencies, are discussed and it is inferred that both CO_2H possess normal structure in the cryst. state.

R. S.

Raman spectrum of keten. H. KOPPER (Z. physikal. Chem., 1936, B, 34, 396—401).—The frequencies of the Raman spectrum, which has been measured at -80° to -90° , correspond with what would be expected for the structure $\text{H}_2\text{C}:\text{C}:\text{O}$.

R. C.

Raman effect of organic substances. VII. Raman effect of furan derivatives. K. HAN (Bull. Chem. Soc. Japan, 1936, 11, 701—711; cf. A., 1934, 1155).—The Raman spectra have been measured of 2-furfuryl Me and Et ether, 2-furfurylacetone, 2-furyl-ethylene, 2-furonitrile, 2:5-dimethylfuran, 5-methyl-2-furonitrile, and Et 2-methyl-3-furoate. The frequencies of the 2-furfuryl radical are characterised and constitutive effects in the region $1400\text{--}1600\text{ cm.}^{-1}$ are discussed.

O. D. S.

Raman spectrum of decahydronaphthalene. S. M. MITRA (Z. Physik, 1936, 103, 542—545).—52 lines excited by λ 4047 and 4358 are given and compared with those obtained for C_{10}H_8 and cyclohexane.

A. E. M.

Raman spectra of some substituted triphenols and of tannin. B. SUSZ, S. FRIED, and E. BRINER (Helv. Chim. Acta, 1936, 19, 1359—1371; cf. A., 1935, 1446; 1936, 1359).—Additional Raman data are recorded for Me triacetylgallate and acetyltannin, and the results for this class of compound are compared and discussed.

J. W. S.

Ionisation of air by irradiated cholesterol. A. H. ROFFO and A. E. ROFFO (Compt. rend., 1936, 203, 1190—1191).—Cholesterol irradiated for 240 hr. with a Hg-vapour lamp caused ionisation of air.

A. J. E. W.

Influence of temperature on fading time of fluorescence of uranin solutions. S. W. CRAM (Z. Physik, 1936, 103, 551—559).—In $\text{EtOH-H}_2\text{O}$ solutions of low concn. (1×10^{-4} g. of uranin per c.c.), the fluorescence resonance time decreases considerably with rise in temp. from 0° to 30° ; further rise in temp. has little effect. This temp. effect disappears as concn. of dye increases and is negligible at 6×10^{-3} g. per c.c. Increase in viscosity of solvent also decreases the effect. The theories of Franck and Vavilov do not explain the results.

H. C. G.

Rules for fading of polarised fluorescence. II. A. JABLONSKI (Z. Physik, 1936, 103, 526—535; cf. A., 1935, 915).—Mathematical. Previous work on the depolarising effect due to the Brownian rota-

tional movement of cylindrical mols. is extended to take other depolarising processes into account. It is shown that where fluorescence is unaffected by Brownian rotation, other depolarising processes are also inoperative.

H. C. G.

Spectral absorption and fluorescence of dyes in the molecular state. E. E. JELLEY (Nature, 1936, 138, 1009—1010).—Suspensions of many dyes in solids and liquids, possessing a very narrow absorption band associated with fluorescence of slightly longer λ , parallel to the case of the ruby, have been prepared. The fluorescence is a resonance effect and is not light scattered by small solid particles of dye. Both fluorescence and the absorption band disappear when the dye passes into the cryst. state. Details for the prep. of such suspensions of 1:1'-diethyl- ψ -cyanine chloride and for obtaining the mol. absorption spectrum are given.

L. S. T.

Quenching of fluorescence and photo-sensitisation in solutions. Investigation of photo-sensitisation in solutions. III. E. V. SCHPOLSKI and G. D. SHEREMETIEV (Acta Physicochim. U.R.S.S., 1936, 5, 575—592).—The intensity of fluorescence of solutions of rhodamin G extra (I), uranin (II), eosin B extra (III), and erythrosin in H_2O , EtOH , and COMc_2 remains unchanged on saturating the solutions with O_2 . Na_2SO_3 possesses small but distinct quenching power on aq. solutions of (I), (II), and (III), and the effect of temp. on the intensity of luminescence is increased by its presence. Na_2SO_3 is considered to quench by causing increased association of the dye rather than transferring energy through collisions of the second kind. The intensity of fluorescence of (III) in presence of Na_2SO_3 is unchanged on oxidising the latter by passing O_2 , indicating that the quenching power of Na_2SO_4 is the same as that of Na_2SO_3 . There is no evidence of connexion between quenching by, and photo-sensitised oxidation of, Na_2SO_3 . HgCl_2 quenches and $(\text{NH}_4)_2\text{C}_2\text{O}_4$ increases the fluorescence of aq. solutions of (III). Possible causes for this, and the behaviour when both salts are present, are discussed.

C. R. H.

Excitation of phosphors in the neon discharge tube. A. RÜTTENAUER (Physikal. Z., 1936, 37, 810—813).—A Ne discharge tube in which phosphors may be excited by λ 4000—2500 Å. and the resonance lines λ 736 and 744 is described. It is possible to separate the phosphorescent radiation due to the two λ regions. ZnS phosphors are excited in both the ultra-violet and Schumann ranges, the phosphorescence due to the former increasing in intensity with increasing c.d., whilst that due to the latter decreases in intensity with increasing c.d. and pressure. Commercial ZnSiO_3 phosphors were not excited in either range, but ZnSiO_3 phosphors could be prepared which were very powerfully excited in the Schumann range, but not in the ultra-violet. The excitation of phosphors in Ne discharge tubes may be of industrial importance.

A. J. M.

Luminescence phenomena relative to the production of sensibly white light. M. SERVIGNE (Compt. rend., 1936, 203, 1247—1249).—The effect of traces of Sm on the photo-luminescence of Ca

molybdate and tungstate, containing traces of Ag, is described. Addition of synthetic willemite to such a mixture enables radiation of the spectral character of sunlight to be produced. A. J. E. W.

Photo-effect at selenium barrier layers. P. GORLICH (Z. tech. Physik, 1935, 16, 268—271; Chem. Zentr., 1936, i, 1188).—The Se layer should be 0.08 ± 0.01 mm. thick and formed at 218° . The sputtered Pt layer on the electrode should be $3\text{--}4 \mu$ thick.

H. J. E.

Explanation of photo-electric effect with cuprous oxide. W. BEHRENDT (Physikal. Z., 1936, 37, 886—901).—The photoelectric properties of Cu_2O have been investigated to decide between the kinematic theories of the process put forward by Schottky *et al.* and the concn. theory of Teichmann *et al.* which regards the photo-effect as analogous to a thermo-electric effect. The photo-current and potential of the pre-wall effect increase with increasing thickness of the metal electrode up to a saturation val., making an absorption of electrons in the metal probable. This is in agreement with the Schottky theory. The photo-current with zero external resistance is independent of the presence of a barrier layer. Determinations of thermo-electric power show that there is no analogy between it and photo-potential and no qual. or quant. explanation of the latter is possible on the assumption of concn. elements. The views of Wolff on the mechanism of the crystal photo-effect are used to obtain formulæ for the short-circuit current for the various photo-effects in the Cu_2O cell, which are in agreement with experiment. The effect of temp. on the short-circuit current was also considered. For the pre-wall effect it is unaffected by temp. The effect of temp. on the hinder-wall effect depends on the change of light absorption and not on any change in electron absorption.

A. J. M.

Artificial rectifying layers with electronic semi-conductors of different conducting types. W. HARTMANN (Physikal. Z., 1936, 37, 862—865).—The rectifying properties of Cu_2O with artificial "barrier" layers have been investigated. Similar experiments with ZnO (an electron-excess semi-conductor) showed a considerable rectifying effect, the rectifier working in the opposite sense to Cu_2O .

A. J. M.

Effect of light and heavy hydrogen on the selective photo-effect with the alkali metals. W. KLUGE and W. UHLMANN (Physikal. Z., 1936, 37, 857—862).—The selective photo-effect was investigated for cells containing composite cathodes of the type M-MH-M and M-MD-M (M = Li, Na, K). The substitution of D for H results in a displacement of the spectral sensitivity curve towards the violet in the case of Li and Na, but with K there was no effect. The displacement is larger for Li than for Na, and is connected with the smaller lattice consts. of NaD and LiD compared with those of the hydrides.

A. J. M.

Factors in the ionisation of carbon disulphide by X-rays. L. S. TAYLOR (J. Res. Nat. Bur. Stand., 1936, 17, 557—576; cf. A., 1935, 148; 1936, 1321).—The electrical conductivity of liquid CS_2 exposed to

X-rays has been measured with application of a d.c. field or of a square wave-form a.c. The phenomena observed can be explained by barrier potentials due to space charge. J. W. S.

Ionisation potentials of free radicals. R. G. J. FRASER and T. N. JEWITT (Physical Rev., 1936, [ii], 50, 1091).—Measurements previously described (cf. A., 1934, 1290) are extended, with improved technique, to Me and Et, and give ionisation potentials $11.1 + 0.5$ and 10.6 ± 0.5 volts, respectively. Results are compared with indirect estimations. N. M. B.

Born effect of ionic mobility. Walden's rule. Influence of concentration on electrolytic conductivity. J. J. HERMANS (Z. Physik, 1936, 104, 100—112).—A mathematical discussion of the Born effect from which is derived a formula explaining experimentally observed deviations from Walden's rule. L. G. G.

Influence of pressure of ionic conductivity of solids. W. JOST and G. NEHLEP (Z. physikal. Chem., 1936, B, 34, 348—356).—The theory previously advanced (A., 1936, 666) to account for the abnormally high vals. found experimentally for A in the conductivity equation $\kappa = Ae^{-Q/RT}$ indicates that the conductivity will be influenced by pressure. AgCl and AgBr prove to have (negative) temp. coeffs. of κ with approx. the predicted vals. $\beta\text{-AgI}$ exhibits an anomalous positive temp. coeff., which falls rapidly with increasing pressure. R. C.

Conduction phenomena in semi-conductors. J. A. V. FAIRBROTHER (Proc. Roy. Soc., 1936, A, 157, 50—66).—Using a W wire coated with a layer of insulating material, Langmuir probe methods of measurement in a low-pressure Hg discharge are used to study the electrical behaviour of the insulating material (A., 1929, 1359). The electrical conductivity of pure Al_2O_3 varies with temp. according to Wilson's theory of electronic semi-conductors. The observed phenomenon of electron diffusion through Al_2O_3 supports the theory advanced by Lowry to explain the mechanism of the thermionic emission from oxide-coated filaments. L. L. B.

Grotthus conductivity of molten electrolytes. T. ERDEY-GRÚZ (Z. physikal. Chem., 1936, 178, 138—142).—The equiv. conductivity of most molten electrolytes near the m.p. is that calc. by Walden's rule (A., 1932, 111), assuming complete dissociation into simple ions. This may be explained by supposing that the electrolyte is only partly dissociated into simple or complex ions and that there is conduction by a Grotthus mechanism in addition to normal electrolytic conduction. R. C.

Electrical conductivity of dielectric liquids ionised by X-rays. I. ADAMCZEWSKI (Acta phys. polon., 3, 235—260; Chem. Zentr., 1936, i, 1575).—The ionisation current rises linearly from zero, falls off at higher currents, and finally follows a straight line of small slope. Saturation was not attained (using saturated hydrocarbons as dielectrics) with field strengths up to 17,000 volts per cm.

J. S. A.

Dissociation in electric field, and insulating liquids. K. H. REISZ (Z. physikal. Chem., 1936,

178, 37—42).—The similarity between conduction of the current in gases and conduction in insulating liquids is probably only superficial. Onsager's theory of dissociation in an electric field (A., 1934, 1176) yields a semiquant. explanation of the relation between the conductivity of such liquids at high field strengths and their physical properties. R. C.

Absolute determination of dielectric loss at high frequencies by the condenser-thermometer method. C. SCHMELZER (Ann. Physik, 1937, [v], 28, 35—53).—The condenser-thermometer method of determining the abs. dielectric loss of liquids gives results accurate to $\pm 5\%$. The transition λ (λ_s) was determined for H_2O , MeOH , EtOH , Pr^nOH , Bu^nOH , and Et_2O . Considerable differences are found between the mol. vol. of H_2O , EtOH , and Et_2O calc. from the van der Waals const. b , and the "apparent" mol. vol. calc. from λ_s . The differences for H_2O and EtOH can be explained by assuming a quasi-cryst. structure for these liquids. That for Et_2O is due to the use of a val. of η obtained from Stokes' law, which is not sufficiently accurate for particles of mol. dimensions. The high-frequency conductivity of solutions of HgCl_2 and AcOH in COMe_2 , tetraisoamylammonium iodide in dioxan, and NBu_4Br in C_6H_6 increases more rapidly with increasing frequency than indicated by theory. This is ascribed to the dipole loss of ion pairs. The high-frequency conductivity also increases with increasing field strength, explained as due to a kind of dissociation-potential effect. A. J. M.

High-frequency loss and quasi-crystalline structure of liquids. P. DEBYE and W. RAMM (Ann. Physik, 1937, [v], 28, 28—34).—The variation of dielectric const. of polar liquids with frequency is considered in connexion with the hypothetical quasi-cryst. structure (hindered rotation of mols.) of liquids. The dielectric loss is considered as a function of $y = E/kT$ (E is the "hindrance" energy, kT the thermal energy). Deviations from the val. of the loss calc. by the usual theory are to be expected where y is specially great, i.e., for strongly associated or very viscous liquids. A. J. M.

Dispersion determinations in the region of decimetre waves. M. WIEN (Physikal. Z., 1936, 37, 869—871).—It is possible to calculate from the results of von Ardenne *et al.* (A., 1936, 1182) the transition λ (λ_s) of a no. of dipole liquids, the results being in agreement with those obtained by other methods. For PhNO_2 and glycerol, λ_s varies with the λ at which the dispersion is measured. The Debye theory does not hold for viscous solutions of sucrose. A. J. M.

Dielectric constants of gases and vapours. VII. M. KUBO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1936, 30, 238—243; cf. this vol., 12).—The dielectric const. of 1:4-dioxan vapour has been determined. It is inferred from the val. of the dipole moment (0.43—0.49 D) that $< 5\%$ of the symmetrical *cis*-form is present. R. S.

Dipole moment of tetrachloroethylene. C. L. TSENG, C. LIU, and C. E. SUN (J. Chinese Chem.

Soc., 1936, 4, 473—476).—The dipole moment was zero, indicating symmetry. C. R. H.

Dielectric constants of the ozonides of ethyl fumarate, ethyl maleate, and methylisoeugenol, and the variation of these constants with time. E. BRINER, E. PERROTTET, H. PAILLARD, and B. SUSZ (Helv. Chim. Acta, 1936, 19, 1354—1358).—The dielectric consts. of Et maleate, Et fumarate, and methylisoeugenol and their ozonides have been determined at 23° and 168 m. The vals. for the ozonides are those of the parent compounds and increase with time, probably owing to changes producing H_2O and org. acids. J. W. S.

Refraction and dispersion of gases and vapours. X. Effect of temperature on refractivity of iodine, and refractivity of atomic iodine. A. BRAUN and P. HOLEMANN (Z. physikal. Chem., 1936, B, 34, 357—380).—The mol. refractivity, R , of I vapour for λ 656.3 μ has been determined at 150—1030° at concns. of $1-4 \times 10^{-5}$ g. per c.c. Between 400° and 600° R begins to fall with rising temp., due to dissociation into atoms. From the variation with concn. of R at the highest temp. the at. refractivity of at. I is calc. to be 13.4 ± 0.2 c.c. From this val., R for I_2 has been calc., the variation of this val. with concn. and temp. being due to damping effects and the variation of the optical absorption with temp., respectively. The at. refractivity of at. I for $\lambda \infty$ is 12.5 ± 0.3 c.c. Comparison of this val. with the at. and ionic refractivities of neighbouring elements shows that completion of the outer electron shell causes a considerable fall in refractivity. The refractivity of various iodides is compared with the sum of the at. and ionic refractivities of the constituent elements. R. C.

Refraction in solutions. V. Complete refractivity curve of carbamide. J. M. SCHERSCHEVER and A. E. BRODSKI (Z. physikal. Chem., 1936, B, 34, 145—150; cf. A., 1936, 424).— n has been determined for aq. $\text{CO}(\text{NH}_2)_2$ at concns., c , of 0.003—4.1M at 25°. The graph of the apparent mol. refraction, R , of the solution against \sqrt{c} is similar to that for an electrolyte, so that the form of the latter curve cannot be explained by interaction of the ionic fields and throws no light on the degree of dissociation of the solute. The Φ and Π curves of $\text{CO}(\text{NH}_2)_2$, however, differ characteristically from those of KCl. R. C.

Anomalous dispersion in dipole liquids. J. MALSCH (Physikal. Z., 1936, 37, 849—851).—Recent determinations of anomalous dispersion in glycerol solutions can be explained by assuming that there is a relaxation time for the dipole structure $>$, and distinct from, that for the dipole itself. Experiments with solutions of electrolytes in glycerol indicate the existence of characteristic vibrations of ion complexes in the range of short electric waves. A. J. M.

Solvent action on optical rotatory power. C. O. BECKMANN and K. COHEN (J. Chem. Physics, 1936, 4, 784—804).—The theoretical method of Darwin (A., 1925, ii, 2) is extended to the field of mol. optics and account is taken of the effect of intermol. forces on the optical const. On the basis of the

concept of deformation a relation between the rotivity and the average mol. field of the mol. is developed. An expression for the average field is derived for the limiting case of a continuous medium, and a more general derivation from statistical mechanics is given for a simple mol. model. For gases the expression is related to the dielectric const., and for liquids an analogous expression in terms of molar polarisations is obtained. By experimental verification of these theoretical results the validity of the use of change of rotivity as a measure of the mol. field is established.

W. R. A.

Optical rotatory power of hydrogen and deuterium compounds. H. ERLÉNMEYER and H. SCHENKEL (Helv. Chim. Acta, 1936, 19, 1199—1200).—The vals. of $[\alpha]_D^{20}$ for *l*-OD·CHPh·CO₂D and *d*-OD·CPhMe·CO₂D are -179.10° and $+36.69^\circ$, respectively, compared with -173.27° and $+37.98^\circ$, respectively, for the corresponding H-compounds.

J. W. S.

Mechanical double refraction of oils in relation to molecular structure and association. D. VORLANDER and P. SPECHT (Z. physikal. Chem., 1936, 178, 93—112).—Experiments on the production of mechanical double refraction with the Maxwell-Kundt cylinder apparatus are described. The min. speed of rotation required to produce double refraction in an amorphous liquid is not inversely proportional to the viscosity, and is influenced by constitutive factors. The double refraction of Et cinnamate (I) increases proportionately to the speed of rotation, u , up to a certain point, then tends towards a limit corresponding with equilibrium between the directive mechanical forces and the random mol. movements. The sp. double refraction of (I) and some other liquids passes through a max. with increasing u . Observations are impossible beyond a certain val. of u owing to darkening of the field of vision, a phenomenon apparently due to fine suspended solids in the liquids. The mixture rule is not valid for the double refraction of mixtures of PhMe and *p*-C₆H₄Me·COMe. The angle of extinction increases with u towards a limit or max. val. which is near 45° but depends on the nature and double refraction of the oil, a result which agrees with Haller's theory (A., 1932, 1201).

R. C.

Magnetic rotation and magnetic birefringence of benzene derivatives, pure and in solution. J. RABINOVITCH (Compt. rend., 1936, 203, 1249—1252).—Data are recorded for *o*-, *m*-, and *p*-NO₂·C₆H₄·NH₂, *p*-C₆H₄Me·NH₂, and (CH₂Ph)₂ in COMe₂ solution, *o*-C₆H₄Me·NH₂, in CCl₄ solution, and pure *m*-C₆H₄Me·NH₂. The effect of orientation is discussed.

A. J. E. W.

Magneto-optical properties of liquids. Application to the analysis of hydrocarbons. M. SCHERER (Publ. Sci. tech. Min. de l'Air, 1934, No. 50, 1—91; Chem. Zentr., 1936, i, 1189—1190).—The Verdet const. (C) of the paraffins up to C₁₆H₃₄ follows an additive law (ρ_m for CH₂ = 1.02). In the corresponding olefins C is smaller. Measurements for alkyl-benzenes and -naphthalenes are also recorded. Calc. vals. are generally < observed vals. of C , the differences increasing with decreasing λ and being independent of the length of the org. chain. Paraffins

have a very small negative double refraction, which increases with the no. of C atoms. The first members of the olefins have a small positive val., which becomes negative for higher members. The acetylenes are more negative than the paraffins. The alkylbenzenes have large positive vals. The application of these results to the analysis of mixtures is discussed. Measurements with solutions of Co, Cu, and Fe salts in H₂O and MeOH show anomalies in the dispersion curves near the absorption bands. In most cases circular magnetic dichroism was observed.

H. J. E.

Nature of hydrate binding for the ions of the transition elements, particularly Co⁺⁺⁺. G. JOOS (Ann. Physik, 1937, [v], 28, 54—58).—Co₂(SO₄)₃·Rb₂SO₄·24H₂O shows a very weak paramagnetic susceptibility (χ) determined by the weighing method in an inhomogeneous field. χ varies with temp. in the normal way. In this compound, hydrate formation of the Co⁺⁺⁺ ion is brought about by a rebuilding of the electron shell with true complex formation. The complex is, however, much less stable than [Co(NH₃)₆]⁺⁺⁺. For all other ions of the Fe group the H₂O is bound by electrostatic forces.

A. J. M.

Resonance structures of carbon dioxide, carbonyl sulphide, and carbon disulphide. A. CLOW and J. M. C. THOMPSON (Nature, 1936, 138, 802—803).—A resonance $+O\equiv C-O- \rightarrow O-C\equiv O+$ gives a val. for the magnetic susceptibility of CO₂ in agreement with that observed. Introduction of S is accompanied by a fall in resonance energy, and the experimental val. can be accounted for by the existence of an intermediate state, $+S\equiv C-O-$
 $S-C-O \quad S-C\equiv O+$. A further fall occurs with CS₂ and the calc. and observed diamagnetic susceptibilities indicate resonance between $S-C\equiv S^+ -$
 $S=C=S$.

L. S. T.

Maximum valency of elements and atomic structure. IX. Physical properties and reactivity of molecules in the co-ordination sphere. B. ORMONT (Acta Physicochim. U.R.S.S., 1936, 5, 593—603).—A discussion. A preliminary investigation is recorded in which MgCl₂ di- (I) and tri-allyl alcoholates (II) were brominated with a Br-air mixture at 10°. (I) reacted slowly, but (II) reacted vigorously, one alcohol mol. being brominated.

C. R. H.

Stereochemistry of metallic phthalocyanines.—See A., II, 78.

Low electronic states of simple heteropolar diatomic molecules. I. General survey. II. Alkali-metal hydrides. R. S. MULLIKEN (Physical Rev., 1936, [iii], 50, 1017—1027, 1028—1040; cf. A., 1934, 1288).—Theoretical.

N. M. B.

General calculation of characteristic frequencies of polyatomic molecules. R. MECKE (Z. Physik, 1937, 104, 291—302).—A discussion of the usefulness and validity of mol. models in the evaluation of characteristic frequencies of polyat. mols. Formulæ are developed applicable to many org. compounds.

L. G. G.

Appraisal of empirical formulæ relating equilibrium vibration frequency and distance in

non-hydride di-atom nuclei. C. H. D. CLARK and J. L. STOVES (Phil. Mag., 1936, [vii], 22, 1137—1157; cf. A., 1935, 1448).—The formulæ of Allen *et al.* (*ibid.*, 685), Badger (A., 1934, 477), and Clark (*ibid.*, 833) connecting fundamental vibration frequency and internuclear distance have been compared in respect of their agreement with experimental data for 70 ground and excited states of 33 non-hydride di-atoms. Clark's formulæ are in best agreement for both the simple di-atoms containing one atom of the *K*-series and for the more complex di-atoms. A. J. M.

Recombination of diatomic molecules with emission of radiation. R. ROMPE (Physikal. Z., 1936, 37, 807—808).—The efficiency coeff. for a process involving collision between an excited and an unexcited atom to form a diat. mol. with emission of radiation is very small, being about 10^{-4} for $H^* + H \rightarrow H_2$, and 10^{-3} for $Te^* + Te \rightarrow Te_2$. The process can be expected to occur only when the concn. of excited atoms is great, *e.g.*, at high temp. or in the electric discharge. The spectral intensity distribution in the recombination continuum of the Te_2 discharge was determined. The velocity distribution of the recombining particles follows the Boltzmann law. The temp. of the recombining particles, estimated from the intensity distribution, is 1300—2000° abs. A. J. M.

C-C linking in hexaphenylethane. E. HUCKEL (Z. physikal. Chem., 1936, B, 34, 335—338).—The theory that the weakness of the above linking compared with an ordinary C-C linking is due half to the gain in resonance energy of the double-linking electron on dissociation and half to steric hindrance of the substituents (A., 1936, 291) is criticised. It is shown that the resonance effect cannot be separated experimentally from steric and other effects, so that only the total weakening can be measured. R. C.

Fundamental vibration frequencies of the molecules C_2H_4 , C_2D_4 , and $C_2H_2D_2$. C. MANNEBACK and A. VERLEYSEN (Ann. Soc. Sci. Bruxelles, 1936, 56, B, 349—372).—Mathematical. Using Bonner's experimental data (cf. A., 1936, 269) the potential function and vibration frequencies are calc. Intensities and polarisations of Raman and infra-red spectra of C_2D_4 and $C_2H_2D_2$ are predicted and discussed. N. M. B.

Ionisation, excitation, and chemical reaction in uniform electric fields. II. Energy balance and energy efficiencies for the principal electron processes in hydrogen. R. W. LUNT and C. A. MEEK (Proc. Roy. Soc., 1936, A, 157, 146—166; cf. this vol., 7).—The abs. vals. of the energy efficiencies and fractional energy losses for the principal collision processes effected by an electron swarm moving through mol. H_2 in a uniform electric field are calc. The only assumption involved in the calculations not based on experiment or theory is that the form of the electron distribution is Maxwellian. The energy efficiencies for the excitation of the two lowest triplet states are in good agreement with experiment. Over a wide range of Xp^{-1} , the total fractional energy loss is approx. const. The main conclusion reached is that the Maxwellian distribution represents the actual distribution to a close approximation. L. L. B.

Coulomb's law of force between charges. S. J. PLIMPTON and W. E. LAWTON (Physical Rev., 1936, [ii], 50, 1066—1071).—A very accurate experimental test is described. If the exponent in the law of force is not exactly 2, but is $2 \pm q$, then $q < 2 \times 10^{-9}$ in space remote from matter. N. M. B.

Parachor. II. R. LAUTÉ (Bull. Soc. chim., 1936, [v], 3, 2367—2371; cf. A., 1936, 1325).—The relation between the parachor [*P*] and the crit. const. of a normal liquid is given by $[P] = \phi T_c/P_c^{\frac{1}{3}}$. F. L. U.

Calculation of specific surface and edge and corner energies of small crystals. I. N. STRANSKI (Monatsh., 1936, 69, 234—242).—Mathematical. R. S.

Two-dimensional gases, liquids, and solids. I. LANGMUIR (Science, 1936, 84, 379—383).—An address. L. S. T.

Lattice theory of alkaline-earth carbonates. II. Elasticity constants of aragonite. III. Lattice energy of the crystals of calcite and its thermochemical applications. B. Y. OKE (Proc. Indian Acad. Sci., 1936, 4, A, 514—524, 525—530; cf. A., 1936, 1185).—II. The elasticity const. of aragonite consists of an electrostatic part and a part due to repulsive forces, both of which have been calc.

III. The lattice energy of calcite has been calc. and verified by a thermochemical cyclic process. R. S.

Formation of dehydration nuclei on crystals of chrome alum. J. A. COOPER and W. E. GARNER (Trans. Faraday Soc., 1936, 32, 1739—1744; cf. A., 1935, 151; 1936, 175).—Dehydration nuclei formed on crystals of chrome alum are spherical. Their rate of growth increases up to 0.01 cm., beyond which it is const. On the assumption that the retarding effect at small sizes is due to depression of the dissociation pressure by a surface tension, the latter is calc. to be 7.49×10^6 dynes per cm. F. L. U.

Transformations produced in certain metals by heating in a vacuum or in air. J. J. TRILLAT and S. OKETANI (Compt. rend., 1936, 203, 1064—1066).—Au leaf 50—70 mμ thick, after heating to 500° in a vac. or in inert gas, gives electron-diffraction patterns corresponding with a hexagonal structure (*a* 5.28 Å.) having the *c*-axis perpendicular to the plane of the leaf. Ag is similar. A. J. E. W.

Lattice constant of purest aluminium. A. LEVINŠ and M. STRAUMANIS (Z. physikal. Chem., 1936, B, 34, 402—403; cf. A., 1936, 1186).—The val. is 4.04145 ± 0.00002 Å. at 25°. R. C.

Texture of thinly rolled tungsten foil. W. G. BURGERS and J. J. A. PLOOS VAN AMSTEL (Physica, 1936, 3, 1064—1066).—Electron-diffraction photographs show that the crystallites in rolled W foil have a cube plane parallel to the plane of the foil, and a cube edge at 45° to the direction of rolling. The oxide layer formed on heating in air has the crystallites oriented at random. A. J. E. W.

Structure and magnetic properties of manganese boride, MnB. R. HOCART and M. FAÏLOT (Compt. rend., 1936, 203, 1062—1064).—MnB is

orthorhombic; a 2.95, b 11.5, c 4.10 Å.; 8 mols. in unit cell. The space-group is D_{2h}^6 — $Pnma$. Relative at. parameters are given. The magnetic moment of Mn is 9.65 Weiss magnetons. A. J. E. W.

"Oriented" oxidation of barium. W. G. BURGERS and J. J. A. PLOOS VAN AMSTEL (*Physica*, 1936, 3, 1057—1063).—Ba volatilised on Cu at high temp. gives electron-diffraction patterns showing a preferential orientation of the crystallites with the [111] direction perpendicular to the surface. Oxidation of such oriented layers gives BaO layers with the [110] direction nearly normal to the surface. The directions of closest packing of Ba atoms in the two structures are thus approx. parallel. This result is correlated with similar observations on Fe and FeO (cf. A., 1935, 161). A. J. E. W.

Wüstite phase. H. NOWOTNY and F. HALLA (*Z. anorg. Chem.*, 1936, 230, 95—96).—A mixture of very pure Fe powder with Fe_3O_4 , heated for 2 hr. at 700—750° and quenched in Sn, gives an X-ray diagram showing the wüstite lines. The change does not occur below 550°. Wüstite is decomposed slowly at room temp., as shown by the gradual appearance of Fe_3O_4 lines. F. L. U.

Crystal structure of $H_3PW_{12}O_{40} \cdot 29H_2O$. A. J. BRADLEY and J. W. ILLINGWORTH (*Proc. Roy. Soc.*, 1936, A, 157, 113—131).— $H_3PW_{12}O_{40} \cdot 29H_2O$ is cubic, with 8 mols. in the unit cell and the length of the edge 23.28 Å. The structure has been determined entirely from one powder photograph taken by J. F. KEGGIN. In conformity with the space-group O_h^h , the structure is composed of two interpenetrating diamond lattice-complexes, one consisting of 8 anions ($PW_{12}O_{40}$)⁻³, the other of 8 clusters of H_2O mols. together with the acidic H ($H_3 \cdot 29 H_2O$)⁺³. Each anion is identical with that found by Keggin in the pentahydrate (A., 1934, 479). The positions of all the atoms, except the H atoms, have been found. The 29 H_2O mols. are divided up into six groups, 12 + 6 + 4 + 1. Their interat. distances all lie between 2.8 and 2.9 Å. L. L. B.

Constitution of platinum compounds of cacodyl oxide. K. A. JENSEN and E. FREDERIKSEN (*Z. anorg. Chem.*, 1936, 230, 34—40).—Compounds of the type $PtX_2(AsMe_2)_2O \cdot H_2O$ ($X = Cl, Br, I$) (described, shortly, by Bunsen) have been prepared and their properties studied. They lose 1/2 mol. of H_2O on heating and form more highly coloured compounds. The aq. solutions are acid, in agreement with $[PtX_2(AsMe_2)_2O \cdot H_2O] \rightleftharpoons [PtX_2(AsMe_2)_2O \cdot OH] + H^+$. The I compound (others too insol.) in C_6H_6 shows a high dipole moment, from which a *cis*-configuration is inferred. The anhyd. compound is bimol. (in $CHBr_3$) and has a very small dipole moment. It has therefore a uniplanar *trans*-structure. F. L. U.

Structure of the carbonyl group. Quantitative investigation of oxalic acid dihydrate by Fourier synthesis from X-ray crystal data. J. M. ROBERTSON and I. WOODWARD (*J.C.S.*, 1936, 1817—1824).—Abs. intensity determinations have been carried out for the two principal zones of reflexions from $H_2C_2O_4 \cdot 2H_2O$ (I). The preliminary

structure assigned by Zachariasen (A., 1935, 152) was confirmed, and the results were used to calculate the phase consts. for most of the reflexions. A double Fourier synthesis was made, giving fairly sharp resolution of all the atoms in the mol. in a projection along the b -axis, and of four of the atoms in a projection along the a -axis. Vals. are given for the 12 parameters of the structure. The C—O distances in the CO_2H groups differ slightly (1.24 and 1.30 Å.). The O of H_2O is at 2.52 Å. from one of the O of CO_2H , showing the formation of a true H linking. The other O of CO_2H is almost equidistant from two O of H_2O mols. (2.87 and 2.84 Å.), indicating OH linkings. The C—C distance in (I) (1.43—1.45 Å.), is definitely < that in diamond (1.54 Å.), indicating 23—30% of double linking property in the C—C linking. This linking in (I) is not a true single linking probably because of conjugation of double linkings in adjacent CO_2H . This fact explains the invariance of structure of the C_2O_4 group in the different cryst. forms of (I), and in many oxalates, which show a planar or nearly planar configuration of the group. A. J. M.

Structure of resorcinol. Quantitative X-ray investigation. J. M. ROBERTSON (*Proc. Roy. Soc.*, 1936, A, 157, 79—99).—The unit cell contains 4 asymmetric mols., and has a 10.53 ± 0.03, b 9.53 ± 0.03, c 5.66 ± 0.02 Å.; space-group C_{2v}^2 (Pna). A quant. X-ray investigation has led to a complete determination of the structure. The C_6H_6 rings are regular plane hexagons, the distance C—C being 1.39 ± 0.01 Å. The orientation of the mol. and the co-ordinates of the atoms are given. In the crystal the mols. are grouped in spiral arrays about alternate twofold screw axes, the OH of successive pairs of mols. approaching each other to within about 2.7 Å., indicating the presence of OH linkings. The min. distances of approach between the other atoms on adjoining mols. (C to O, and C to C) are all about 3.5 Å. L. L. B.

***p*-Azoxyanisole in the solid, anisotropic liquid, and isotropic liquid states.** P. CHATELAIN (*Compt. rend.*, 1936, 203, 1169—1171).—The solid is monoclinic with holohedral symmetry; $a:b:c = 1.988:1:2.590$, $\beta = 108^\circ 20'$. Vals. of n for the anisotropic and isotropic liquids, for different λ and temp., are given and discussed. A. J. E. W.

Structure of cellulose acetate soluble in acetone or "cellite." G. CENTOLA (*Atti R. Accad. Lincei*, 1936, [vi], 23, 788—793).—X-Ray measurements indicate that the mol. of cellite consists of chains of glucose residues, some of which may be completely or partly acetylated and others entirely unchanged. Cellite is not merely a mixture of cellulose triacetate and cellulose. O. J. W.

Submicroscopic roughness of metallic surfaces and its effect on the electron interference pattern. F. KIRCHNER (*Ann. Physik*, 1937, [v], 28, 21—27).—The effect of submicroscopic roughness on the electron interference pattern for large single crystals, or surfaces containing many small crystals with parallel orientation, and surfaces with small block-like projections is considered. The case of ordinary metallic surfaces and thin layers is also

discussed. For Ag of thickness 10–50 μ the interference ring is wider for reflexion than transmission. It is shown that this widening is determined by the roughness of the surface, indicating projections to the extent of 100 μ downwards. The greater is the widening the smoother is the surface. The application of these results to polished metal surfaces is considered. The fact that, with polishing, the sharp interference rings are replaced by two wide rings having practically the same diameter for all metals does not indicate the existence of a monol. "liquid" or a Beilby layer on the surface of the metal. It is due to the reduction in height, by polishing, of the crystal blocks projecting from the surface, a refraction effect due to the high polish, and the deformation of the crystal lattice in the process of polishing.

A. J. M.

Beilby layer on non-metals. G. I. FINCH (Nature, 1936, 138, 1010).—Polished plane surfaces cut in arbitrary directions from many types of single crystals, *e.g.*, quartz, diamond, garnets, topaz, etc., yield electron diffraction patterns of spots and lines and thus provide irrefutable evidence of the crystal structure of the polish layer. Other crystals, notably beryl, zircon, tourmaline, cassiterite, and hematite, give patterns of diffuse haloes typical of liquid Hg and various glasses. Etching restores the crystal pattern. The results establish the validity of Beilby's view of the formation of an amorphous polish layer which may, however, subsequently recrystallise.

L. S. T.

Electronic diffraction study of bromochloroform. P. CAPRON and M. DE HEMPTINNE (Ann. Soc. Sci. Bruxelles, 1936, 56, B, 342–348).—Using Pauling's method (*cf.* A., 1936, 272), interat. distances calc. from electron diffraction photographs are: C–Br 2.01, Br–Cl 3.00, C–Cl 1.76, Cl–Cl 2.95 Å. Possible structural arrangements are discussed.

N. M. B.

Electronic analysis of surfaces by means of slow electrons. R. J. MOON and W. D. HARKINS (J. Physical Chem., 1936, 40, 941–957).—Apparatus for the study of surfaces by electron diffraction is described. Using a const. angle of incidence = angle of reflexion and a varying accelerating potential (P), the collector current– P curve for liquid oleic acid in bulk shows three max. A pronounced fatigue effect is observed. The (100) cleavage plane of NaCl gives max. corresponding with an inner potential 0 and one of about 10 volts. The (100) plane of galena gives no distinct max. at room temp., but several at 206° corresponding with an inner potential of 16.9 volts. In presence of a trace of org. vapour the grating properties of a galena surface are permanently destroyed by slow electrons at 206°.

F. L. U.

Changes in resistance, with time, of thin sputtered metal layers. V. VAND (Z. Physik, 1936, 104, 48–67).—The electrical resistance in vac. of sputtered films of Ag and Au is shown to decrease hyperbolically with time and approach a fixed min. val. asymptotically. The resistance–time curve after admission of air to the film is also hyperbolic but in this case the asymptotic part of the curve increases to a val. slightly > that in vac. The resistance changes are not due to diffusion in the film, but to

local disintegration of the lattice structure. This theory is elaborated mathematically. L. G. G.

Magnetic anisotropy of single crystals of iron and nickel. H. SCHLECHTWEIG (Ann. Physik, 1936, [v], 27, 573–596).—A discussion of the interpretation of magnetic experiments at large field strengths where the magnetisation process can be considered as a rotation of the magnetic vector of the crystal. The case of a crystal disc suspended from a torsion wire with its plane parallel to a magnetic field is considered in detail. From the variation in the moment of rotation of a suspended disc of Krupp "Hyperm 4" containing 4.4% Si with the direction of the magnetic field it is deduced that the anisotropy const. of the metal is 2.56×10^5 ergs per cm^3 .

O. D. S.

Variation with temperature of the magnetostriction of nickel. W. DÖRING (Z. Physik, 1936, 103, 560–582).—The magnetostriction of polycryst. Ni has been measured for temp. up to 400°. With increasing magnetic field the effect quickly reaches saturation at all temp., but the saturation val. falls with rising temp. to a very small quantity above 360°. The saturation magnetostriction \propto the square of the saturation magnetisation over the temp. range.

A. E. M.

Ferromagnetic anisotropy in single crystals and in polycrystalline sheets. R. M. BOZORTH (Physical Rev., 1936, [ii], 50, 1076–1081).—It is shown theoretically that the (110) direction may under certain conditions be the direction for easiest magnetisation. Magnetisation curves for single crystals of Fe, Ni, and Fe–50% Ni are calc. and discussed. The anisotropy const. for an Fe single crystal is calc. from experimental data.

N. M. B.

Reversible and irreversible magnetisation processes with change of temperature. N. EMBIRIKOS and H. BITTEL (Physikal. Z., 1936, 37, 901–906).—The hysteresis loops of Ni + 1% Mn, Ni + 1% Cr, and Ni + 2% Cr are decreased in area by shaking the test-piece. The effect of temp. on magnetisation may be divided into a reversible and an irreversible part. The reversible part decreases with rise of temp., and increases with increasing field strength. The theory of the process is considered. Variation of electrical conductivity with magnetisation is determined only by the reversible process.

A. J. M.

Temperature dependence of the intensity of magnetisation of ferromagnetic substances in weak magnetic fields. K. HONDA and T. NISHINA (Z. Physik, 1936, 103, 728–737).—This is studied on Fe single crystals and polycryst. electrolytic Fe and Ni in the light of the Honda–Okubo theory. L. G. G.

Optical constants of fluorite in the extreme ultra-violet. R. TOUSEY (Physical Rev., 1936, [ii], 50, 1057–1066).—Using the method of photographic photometry with a vac. spectrograph, high-precision measurements of the reflecting power of a polished fluorite surface were obtained at nineteen λ over 1605–927 Å. for 45°, 60°, 75°, and 85° incidence. Curves for n and extinction coeff. are calc. The extinction curve shows an absorption band of approx. 100 Å. half-width, with max. near 1115 Å. The

absorption increases again below 1060 Å. There is evidence of a surface layer having a higher absorption coeff. and reflecting power than fluorite itself.

N. M. B.

Theory of rupture of brittle bodies. A. SMEKAL (Z. Physik, 1936, 103, 495—525).—A theory is developed to explain the processes involved in the breakage of homogeneous and inhomogeneous bodies, with one or more cracks on the surface or inside the body.

A. E. M.

Strength of rock-salt crystals. I. Influence of temperature and internal impurities. II. High-vacuum strength and influence of adsorbed impurities. W. BURGSMÜLLER (Z. Physik, 1936, 103, 633—654, 655—670).—I. The breaking strength of rock-salt and of synthetic NaCl crystals with and without uniformly distributed impurities has been studied between -271.8° and 500° .

II. The breaking strength of synthetic NaCl crystals in vac. between -90° and 500° , together with the influence of adsorbed gases, is studied. The effect of adsorbed impurities as compared with uniformly distributed impurities (see above) on crystal cohesion and plasticity is discussed.

L. G. G.

Effect of temperature on the strength of rock-salt crystals. K. KRUGEL (Z. Physik, 1937, 104, 194—196).—The breaking strength of synthetic NaCl crystals increases regularly between room temp. and 350° . Above 350° fluctuations in strength due to constriction and lattice rotation occur.

L. G. G.

Method of estimating the distribution of molecules of different sizes in macro-molecular systems. H. DOSTAL and H. MARK (Naturwiss., 1936, 24, 796).—A method of estimating the no. of mols. of different mol. wts. in a system is based on determinations of viscosity and osmotic pressure.

A. J. M.

Thermal resistance of bismuth single crystals at low temperatures, and in a magnetic field. W. J. DE HAAS, A. N. GERRITSEN, and W. H. CAPEL (Physica, 1936, 3, 1143—1158).—Data for the thermal and electrical resistances are recorded; the apparatus and technique are described. The thermal conductivity at low temp. is largely affected by the purity of the lattice; its dependence on a transverse magnetic field was followed up to a saturation val. at each temp. investigated. The results are discussed in relation to the electronic and lattice conductivities, and the Wiedemann-Franz-Lorenz const.

A. J. E. W.

Translatory effect of deformation on metallic conduction. A. PERRIER (Helv. phys. Acta, 1935, 8, 494—497; Chem. Zentr., 1936, i, 1188).

H. J. E.

Diamagnetic susceptibility of thallium compounds. V. C. G. TREW (Trans. Faraday Soc., 1936, 32, 1658—1667).—Measurements of the mass susceptibility of 27 Tl^+ compounds gives -38.4×10^{-6} for the susceptibility (χ) of the Tl^+ ion. The val. of χ calc. by Slater's method (A., 1930, 1234) is considerably $>$ the observed val., and comparison with the data for Hg and Pb indicate that the discrepancy is due to too high a val. for the screening const. of the 5d and 6s levels given by this method. From the

observed val. of χ 1.36 Å. is deduced for the ionic radius of Tl^+ , compared with 1.49 Å. from X-ray data.

F. L. U.

Paramagnetic rotatory power of hydrated dysprosium ethyl sulphate: paramagnetic saturation. J. BECQUEREL, W. J. DE HAAS, and J. VAN DEN HANDEL (Physica, 1936, 3, 1133—1142).—Measurements on $Dy(EO_4)_3 \cdot 9H_2O$ are recorded. At liquid He temp., the paramagnetic rotation in the direction of the optic axis is $\rho_{||} = A \times \tanh(\mu H_a/kT) + BH_a$ (H_a —effective magnetic field strength, k —Boltzmann const.). The first term indicates the occurrence of only one doubly degenerate energy level at low temp.; the second term, of much smaller magnitude, represents a distinct type of paramagnetism. Paramagnetic saturation was observed at 1.62° abs., with $H_a = 25,000$ gauss. The relation given does not apply at liquid H_2 or higher temp., where more than one energy level occurs.

A. J. E. W.

Magnetism of diradicals. E. HÜCKEL (Z. physikal. Chem., 1936, B, 34, 339—347).—A quantum theory interpretation is given of the fact that if two CPh_3 are linked by removal of two H atoms the product formed by linking in the $p-p'$ -position is diamagnetic, whilst linking in the $m-m'$ -position yields a paramagnetic product (A., 1935, 689). The second compound must be capable of existing also in a diamagnetic state with only slightly different energy.

R. C.

Diffraction of light by ultrasonic waves: a test for polarisation. S. PARTHASARATHY (Current Sci., 1936, 5, 243).—Tests made on *m*-xylene for incidences of the light beam normal and oblique to the sound wave front at frequencies of 7.164×10^6 and 20.00×10^6 cycles per sec. and different light λ showed no polarisation.

N. M. B.

Visibility of ultrasonic waves in liquids. S. PARTHASARATHY [with N. S. N. NATH] (Proc. Indian Acad. Sci., 1936, 4, A, 555—561; cf. A., 1936, 1453).—When a beam of monochromatic light is passed through a liquid subjected to stationary ultrasonic waves, and focussed by a microscope, a pattern appears periodically when the distance between the microscope and the cell is increased. Multiplication of the fringes occurs at intermediate distances. The influence of ultrasonic amplitude and obliquity of light waves to sound waves has been investigated and a theory is advanced.

R. S.

Optical examination of supersonic wave fields in liquids and glasses. E. HIEDERMANN (Z. Physik, 1937, 104, 197—206).—The amplitude distribution in supersonic wave fields in liquids and glasses has been studied by an improved method. The results are illustrated and compared with other similar work.

L. G. G.

Calculation of latent heats of evaporation. P. GUARESCHI (Atti R. Accad. Lincei, 1936, [vi], 23, 783—787; cf. this vol., 72).—A relationship for the latent heat of evaporation of liquids as a function of the coeff. of association is derived.

O. J. W.

Specific heat of paramagnetic crystals at low temperatures. I. WALLER (Z. Physik, 1936, 104, 132—134).—A formula is derived for the contri-

bution to the sp. heat of energy from the magnetic field. L. G. G.

Specific heats of metal electrons. A. SOMMERFELD (Ann. Physik, 1937, [v], 28, 1—10).—A review of recent theoretical and experimental work.

A. J. M.

Specific heat of iron. (MME.) E. LAPP (Ann. Physique, 1936, [xi], 6, 826—855).—High-precision data and correction terms, for the temp. range 18—960°, are reported. Magnetic and calorimetric data are compared. N. M. B.

Heat capacities of silver, nickel, zinc, cadmium, and lead from -80° to 120°. H. L. BRONSON and A. J. C. WILSON (Canad. J. Res., 1936, 14, A, 181—193; cf. A., 1933, 559).—Mean heat capacities over 10° intervals from -80° to 120° have been determined. Vals. of C_p calc. from Debye's expression and involving no calorimetric data show an average deviation of 0.7% from the experimental vals. Equations fitting the experimental curves are given.

F. L. U.

Heat capacity of silver and nickel between 100° and 500°. H. L. BRONSON, E. W. HEWSON, and A. J. C. WILSON (Canad. J. Res., 1936, 14, A, 194—199; cf. preceding abstract).—Mean heat capacities between 0° and various temp. between 100° and 500° have been determined, and vals. corresponding with the higher temp. calc.

F. L. U.

Intensity of orbital interaction in metals. R. FORRER (Compt. rend., 1936, 203, 1268—1270).—The m.p. of a solid is given by $T = F\sqrt{N}$, where F is a temp. about 300°, and N is the no. of "contacts" between electronic orbits. Vals. of F obtained for the elements are discussed in relation to the electronic configurations of their atoms.

A. J. E. W.

Approximate correction of b.p. for variation in barometric pressure. R. LIVINGSTON (Science, 1936, 84, 459).—The relation $\Delta T = 0.1T_{b.p.} \times \Delta P_{atm.}$ holds to 0.1° for normal liquids for changes in pressure of 15 to 20 mm.

L. S. T.

Determination of velocity of fusion. G. TAMMANN and H. HARTMANN (Z. anorg. Chem., 1936, 230, 53—64).—A method is described whereby the rate of melting of a cylindrical rod of material maintained at a const. temp. near its m.p. may be measured when heat is supplied at a known rate to one end. The rate of flow of heat deduced from the observed rate of melting is compared with that calc. theoretically for the experimental conditions. The same method is applied to the rate of melting at the surface of contact between rods of different materials [Sn-Pb, Cd-Zn, Ag-Cu, NHAcPh-C₆H₄(NO₂)₂, and Fe-C] which form a eutectic.

F. L. U.

Heat movement in solids and liquids and the theory of melting. J. I. FRENKEL (Bull. Acad. Sci. U.R.S.S., 1936, 371—393).—A review with particular reference to the author's own work (cf. A., 1936, 1189).

J. J. B.

Critical temperature of normal liquids. R. LAUTIE (Bull. Soc. chim., 1936, [v], 3, 2337—2343; cf. A., 1936, 149).—The abs. crit. temp. of a normal liquid is related to its mol. wt. best by the expression

$2500\sqrt{M/T_c} = 101$, provided that T_c/\sqrt{M} lies between 36 and 68. The alternative expression $T_c = 1.2T_b + 10\sqrt{M} + 20$ (T_b = abs. b.p.) takes account of the difference between isomerides. The range of validity of these expressions is illustrated.

F. L. U.

Density of liquid and solid bodies. A. BREITWIESER (Suddents. Apoth.-Ztg., 1936, 16 pp.).—Abridgement of a monograph, giving methods.

R. S.

Empirical expression for the specific volume of superheated water vapour. P. TONGAS (Compt. rend., 1936, 203, 1134—1136).—The sp. vol. $v = 47.07T/p - 10^{(0.00292T - 1.455)/(10^{(0.00439T - 0.0345)} - 33 - p/10^4)}$ cu. m. per kg., for $p = 1 - 300$ kg. per sq. cm. and $T = 373 - 823^\circ$ abs.

A. J. E. W.

Vapour pressures of liquid krypton. J. J. MEIHZEN and C. A. CROMMELIN (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1088—1089).—The v.p. of liquid Kr between the triple point (115.97° abs., $p = 0.7204$ atm.) and the crit. point (209.39° abs., $p = 54.182$ atm.) is expressed by $\log p_{atm.} = -899.979/T - 12.55400 \log T + 31.50311 + 0.0175105T$. The b.p. of Kr is 119.93° abs.

O. D. S.

Temperature distribution in boiling water. W. FRITZ and F. HOMANN (Physikal. Z., 1936, 37, 873—878).—The variation of temp. with height of a column of boiling H₂O was determined by means of thermo-elements, the H₂O being heated by a polished metal hot-plate. The temp. deviates considerably from that calc. from the hydrostatic pressure within the liquid. The phenomenon of superheating is considered.

A. J. M.

Recent advances in physical science. E. T. JONES (Proc. Roy. Phil. Soc. Glasgow, 1936, 62, 114—122).—The approach to abs. zero of temp. and the nature of electrostatic force are discussed.

N. M. B.

Range of validity of Nernst heat theorem. H. SCHMOLKE (Z. Physik, 1937, 104, 221—227).—It is shown that, with insufficient theoretical foundation, the limit of validity of Nernst's heat theorem is often exceeded.

L. G. G.

Complete equation of state of one-, two-, and three-dimensional gases of hard elastic spheres. L. TONKS (Physical Rev., 1936, [ii], 50, 955—963).—Mathematical. For a linear gas the equation is $fl = NkT/(1 - \theta)$, where f = the force, and l the length of the gas, N the total no. of atoms, and θ the fraction of the gas length occupied by the atoms. A linear gas consisting of a single atom obeys, on a time average, statistical laws. For a plane gas $a = NkT/(1 - \theta)$, where τ is the surface tension, a the area of the gas, and θ has vals. near 1. For three dimensions $pv = NkT(1 - \theta^3)$.

N. M. B.

Quantum theory of the equation of state at low temperatures. L. GROPPER (Physical Rev., 1936, [ii], 50, 963—974; cf. Slater, A., 1931, 1117).—Mathematical. The quantum formulæ for the second virial coeff. B are derived for the case of Boltzmann, Einstein-Rose, and Fermi-Dirac statistics, and are expressed in terms of the phases of the Schrödinger wave function. For low temp. the expression for B

is developed in a power series of T , the temp. which gives agreement in the case of the experimental formula for He.
N. M. B.

Heat conduction by rarified gases. II. Thermal accommodation coefficient of helium, neon, and nitrogen on glass at 70° to 90° abs. W. H. KEESOM and G. SCHMIDT (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1048—1049, and Physica, 1936, 3, 1085—1092; cf. A., 1936, 1059).—The accommodation coeffs. of the gases on glass increase with decreasing temp. At 70° to 90° abs. the coeffs. of He, Ne, H, and N are respectively 0.383, 0.555, 0.803, and 1.02.
O. D. S.

Viscosity of gases. P. GUARESCHI (Atti R. Accad. Lincei, 1936, [vi], 23, 603—609).—The viscosity of gases is discussed from the point of view of the kinetic theory. η is a function of the coeff. of association, α , of the gas, and when $\alpha = 1$ the val. of η for all gases is 1125×10^{-7} . The temp. at which $\alpha = 1$ is given by $\sqrt{(MT)/\sigma^2} = 3.95 \times 10^{16}$, where σ is the mol. diameter.
O. J. W.

Viscosity of liquids. II. P. GUARESCHI (Atti R. Accad. Lincei, 1936, [vi], 23, 690—695; cf. preceding abstract).—The author's relationship for the viscosity of gases as a function of the mol. vol. and the coeff. of association holds also for liquids.
O. J. W.

Oiliness of liquids. I. Determination of the static friction coefficients. J. SAMESHIMA, M. KIDOKORO, and H. AKAMATU (Bull. Chem. Soc. Japan, 1936, 11, 659—666).—Static friction coeffs. have been determined for Me, Et, Prⁿ, Buⁿ, *n*-, *sec*-, and *tert*-amyl, *n*-hexyl, heptyl, and octyl alcohol, acetic, propionic, butyric, valeric, hexoic, heptoic, octoic, and nonoic acid, C_nH_{2n+2} ($n = 6-9$), C₆H₆, PhMe, liquid paraffin, (CH₂·OH)₂, EtOAc, oleic acid, and lubricating oil. Amonton's law does not hold when the wt. moved is small.
R. S.

Viscosity of gas mixtures and its representation by gas-kinetic mixture formula. E. SCHRÖER (Z. physikal. Chem., 1936, B, 34, 161—180).—A review of existing data shows that Sutherland's viscosity equation, $\eta_{12} - \eta_1/(1 + n_2 A_1/n_1) + \eta_2/(1 + n_1 A_2/n_2)$ is valid for mixtures of permanent gases, whilst for other gases the deviations are not so great as to warrant making any supplementary assumptions, such as polymerisation, association, or dipole-quadrupole effects. London's theory of van der Waals forces leads to a val. of ~ 0.95 for f in the equation $C_{12} =$ for the Sutherland const. of the mixture, and this figure agrees with the experimental data (cf. A., 1930, 536). The viscosities of mixtures of SO₂ with MeCl and with Me₂O have been measured; there are positive deviations from the above equation which fall with rising temp.
R. C.

Viscosity of binary mixtures. A. J. A. VAN DER WYK (Nature, 1936, 138, 845—846).—A formula is given which expresses the results obtained for CH₂Ph·OBz-PhMe and C₆H₁₄-CCl₄ mixtures.
L. S. T.

Range of accuracy and values of the constants in the various formulæ of Lichteneckers for

mixtures. D. A. G. BRUGGEMAN (Physikal. Z., 1936, 37, 906—912).—The formulæ put forward by Lichteneckers for the properties of mixtures in terms of those of their components have been tested in the case of vol., n , dielectric const., and conductivity.
A. J. M.

Ultra-violet absorption and orientation polarisation of binary mixtures: allylthiocarbimide and piperidine. R. KREMANN and O. FRUHWIRTH (Monatsh., 1936, 69, 319—341; cf. A., 1933, 885).—Absorption is a max. in the 50 mol.-% mixture, but on either side of the max. the curve deviates from linearity owing to (dipole) association between the compound and each of the components; the orientation polarisation curve shows the same effect. The calc. dipole moment for C₅H₁₀N·CS·NH·CH₂·CH·CH₂ is in good agreement with that obtained for the 50% mixture. An apparatus for the determination of dielectric consts. is described and the equilibrium diagram for CH₂·CH·CH₂·NCS, C₅H₁₁N, and C₆H₁₄ is given.
R. S.

Diamagnetism of mixtures of organic liquids. J. F. SPENCER and V. C. G. TREW (Nature, 1936, 138, 974—975; cf. A., 1932, 216).—Remeasurement of the magnetic susceptibilities of CHCl₃-COMe₂, COMe₂-CHCl·CCl₂, and CHCl₃-Et₂O by the Gouy method show that deviations from linearity are $>4\%$. For many pairs of org. substances the deviations are small, rarely $>0.5\%$, when the constitutions and mol. wts. of the constituents are similar; they amount to 1—4% when the constitutions or the mol. wts. are markedly different.
L. S. T.

Equilibrium of liquid and vapour in the system argon-oxygen. P. BOURBO and I. ISCHKIN (Physica, 1936, 3, 1067—1081).—The total pressure (p) has been determined for four mixtures between 87° and 96.5° abs. The relation $\log p = A + B/T$ is confirmed. The mixtures form "regular" solutions (cf. A., 1929, 266), the Hildebrand equation applying accurately to the results.
A. J. E. W.

Control of composition in the application of the Debye-Scherrer method of X-ray crystal analysis to the study of alloys. W. HUME-ROTHERY and P. W. REYNOLDS (J. Inst. Metals, 1937, 60, Advance copy, 541—550).—The lump specimen must be annealed to remove coring at a suitable temp. bearing a definite relation to the temp. at which the filings are to be annealed. Filings should be taken with a new file and washed with C₆H₆ or CCl₄ to remove grease, light impurities (dust etc.) being simultaneously removed by elutriation. The filings used for the X-ray work should be analysed, both metals of binary alloys being determined; analysis of the original lump is liable to give misleading results owing to segregation effects.
A. R. P.

Lattice spacings of certain primary solid solutions in silver and copper. W. HUME-ROTHERY, G. F. LEWIN, and P. W. REYNOLDS (Proc. Roy. Soc., 1936, A, 157, 167—183; cf. A., 1934, 725).—Measurements have been made of the mean lattice spacings of primary solid solutions of Cd, In, Sn, and Sb in Ag, and of Zn, Ga, and Ge in Cu. In each series of alloys increasing valency of the solute pro-

duces an increased lattice distortion at equiat. compositions. In dil. solid solutions in Ag, equal at. percentages of Cd, In, Sn, and Sb expand the lattice of Ag by amounts $\propto 2:3:4:6$, respectively. For the Cu alloys the relative factors for Zn and Ga are as 3:4, but the corresponding factor for Ge is 4.8. It is suggested that in both series increasing valency tends to expand the lattice, but that this expansion is opposed by some factor which is relatively more important in the Cu series. L. L. B.

Metals and alloys. XX. X-Ray analysis of gallium bronzes. E. ZINTL and O. TREUSCH. **XXI. Stoichiometry of binary sodium compounds.** E. ZINTL and A. HARDER (Z. physikal. Chem., 1936, B, 34, 225—237, 238—254; cf. A., 1936, 1193).—**XX. X-Ray analysis** shows the existence of three intermediate phases at room temp. Cu takes up ~ 15 at.-% Ga with distension of the lattice (α -phase). Alloys with 20—24 at.-% Ga show the presence of the α -phase, a μ -phase (probably having closest hexagonal spherical packing with a 2.594, c 4.229 Å.), and a δ -phase (cubic, with a 8.711 Å., formula Cu_5Ga_4 , and the same type of crystal as γ -brass) (cf. A., 1935, 22). The intermediate phase ϕ , which has a narrow region of homogeneity at ~ 58 at.-% Ga, has a tetragonal layer lattice with a 2.830, c 5.831 Å., and represents the compound CuGa_2 , which does not exist in the pure state but is stabilised by mixed crystal formation with Cu.

XXI. By fusing Pb or Sn with Na and extracting the excess of Na with liquid NH_3 the compounds richest in Na have been found to be $\text{Na}_{15}\text{Pb}_4$ (cubic, a 13.29 Å., space-group T_d^2) and $\text{Na}_{15}\text{Sn}_4$ (rhombic, a 9.79, a_2 22.78, a_3 5.56 Å., and 38 atoms in the unit cell). It is inferred that the max. Na content permitted by the valency rules for binary compounds of Na with elements 1—4 places before the inert gases having a completely ordered distribution of atoms is not always reached when the negative atom ion is more readily polarised. R. C.

X-Ray investigation of system manganese-antimony. F. HALLA and H. NOWOTNY (Z. physikal. Chem., 1936, B, 34, 141—144).—In the above system there is a tetragonal solid phase, Mn_2Sb , with a 4.08, c 6.56 Å., and space-group D_{4h}^1 ; it is isomorphous with Fe_2As and Cu_2Sb . R. C.

Nature of the solid solution of antimony in lead. N. V. AGEEV and I. V. KROTOV (J. Inst. Metals, 1936, 59, Advance copy, 493—500).—Evidence from X-ray analysis and determinations of d indicates that the solid solution of Sb in Pb is of the monat. type; this is confirmed by thermodynamic analysis if it is assumed that the accepted solubility line in the equilibrium diagram may be in error to the extent of $\pm 2^\circ$. A. R. P.

Solubility of silver and gold in solid magnesium. W. HUME-ROTHERY and E. BUTCHERS (J. Inst. Metals, 1937, 60, Advance copy, 551—556).—Mg dissolves a max. of 15.3% Ag at the eutectic temp. (471°) and the solubility decreases with fall in temp. to 3.9% Ag at 300° . The solubility of Au in Mg increases with rise in temp. to a max. of 0.1 at.-% at 575° . A. R. P.

Alloys of magnesium. IV. Constitution of magnesium-rich alloys of magnesium and silver. R. J. M. PAYNE and J. L. HAUGHTON. **V. Constitution of magnesium-rich alloys of magnesium and cerium.** J. L. HAUGHTON and T. H. SCHOFIELD (J. Inst. Metals, 1937, 60, Advance copy, 557—562, 605—612).—**IV.** The system has been examined by thermal and micrographic analysis. The eutectic is at 472° (48.6% Ag) and the solid solubility falls from 15% at this temp. to $<1\%$ at 200° (cf. preceding abstract). Mg_3Ag is formed by a peritectic reaction at 495.5° .

V. Thermal and micrographic analysis shows a eutectic at 590° , 21% Ce, the solid solubility increasing from $<0.15\%$ Ce at 337° to about 1.6% at 590° , and a peritectic reaction at 614° in alloys with $>30\%$ Ce. A. R. P.

Constitution of silver-rich antimony-silver alloys. P. W. REYNOLDS and W. HUME-ROTHERY (J. Inst. Metals, 1937, 60, 645—654).—Examination of the system by thermal and micrographic methods up to 25 at.-% Sb has shown that the system closely resembles the Sn-Ag system. A peritectic horizontal occurs at 702.5° in alloys with 7.2—17.0 at.-% Sb due to the reaction liquid + $\alpha \rightleftharpoons \beta$. The β -phase is a close-packed hexagonal solid solution which reacts with liquid at 558.2° to form γ (Ag_3Sb), the peritectic horizontal starting at 16.3 at.-% Sb. The range of α solid solution decreases by about 1.6 at.-% Sb between 700° and 300° and the composition of the β -phase at 702.5° is 8.8 at.-% Sb. A. R. P.

Mercury-thallium alloys and their use for thermometric purposes. H. MOSER (Physikal. Z., 1936, 37, 885—886).—The Hg-Tl system shows two eutectics at 8.5% and 40.4% Tl, respectively. The physical properties of these alloys have been examined with special reference to their possible use in thermometry. The 8.5% Tl alloy has m.p. $-60.0 \pm 0.2^\circ$, and may therefore be useful as a thermometric liquid at low temp. Thermometers filled with it behave in all other respects like Hg thermometers. The 40.4% Tl alloy has m.p. -0.8° , and its v.p. at 500° is about half that of Hg. It may therefore be used at higher temp. although the difficulty of filling an instrument with the alloy is a disadvantage. A. J. M.

Magnetic investigation of the system zinc-aluminium. H. AUER and K. E. MANN (Z. Metallk., 1936, 28, 323—326).—The vals. of the diamagnetic susceptibility of Al-Zn alloys indicate that the solubility of Al in Zn is 0.1% at 100° , 0.38% at 200° , and 1.1% at the eutectic temp. (370°). The β $\alpha + \gamma$ eutectoid horizontal is at 270° and begins at 0.65% Al. The solubility of Fe in Zn is small at room temp. but increases slightly with rise in temp. A. R. P.

Ternary system aluminium-magnesium-zinc. II. Section $\text{Al}-\text{Al}_3\text{Mg}_4-\text{Al}_2\text{Mg}_3\text{Zn}_3-\text{Al}$. W. KÖSTER and W. DULLENKOPF (Z. Metallk., 1936, 28, 309—312; cf. A., 1936, 1194).— Al_3Mg_4 (δ) and $\text{Al}_2\text{Mg}_3\text{Zn}_3$ (T) form a pseudo-binary system with a eutectic at 450° , Al 36, Mg 44, Zn 20%, the two constituents of which are solid solutions with Al 41, Mg 48, Zn 11, and Al 22, Mg 28, Zn 50%, respectively.

A ternary eutectic occurs at 447°, Al 57, Mg 31, Zn 12% between the α , β , and T phases of the ternary system. The four-phase reaction: liquid (Al 51, Mg 39, Zn 10%) + δ (Al 50, Mg 45, Zn 5%) \rightleftharpoons γ + T (Al 44, Mg 33, Zn 23%) occurs at 449° and the four-phase reaction: liquid + γ (Al 55, Mg 40, Zn 5%) \rightleftharpoons β + T at 448°. A. R. P.

System aluminium-magnesium-zinc. K. RIEDERER (Z. Metallk., 1936, 28, 312—317; cf. preceding abstract).—The various phases have been examined by X-rays; β is hexagonal a 11.38 Å., c/a 1.57, δ is body-centred cubic, a 10.45—10.56 Å., 58 atoms in the unit cell, and T ($\text{Al}_2\text{Mg}_3\text{Zn}_3$) is also body-centred cubic with 160 atoms in the unit cell, a 14.29—14.27 Å. along the section T- β and 14.29—14.60 Å. along the section T- δ . The limits of homogeneity of T in these directions are Al 44.6, Mg 31.7, Zn 23.7% and Al 27.5, Mg 32.5, Zn 40%, respectively. A. R. P.

Hume-Rothery binding forces in metallic compounds. F. LAVES (Naturwiss., 1936, 24, 742).—It is possible to prepare a continuous series of mixed crystals of Mg and AgCd_3 (a "Hume-Rothery" compound). Debye-Scherrer diagrams show a continuous displacement of lines as the amount of Mg is increased. This indicates that there is no essential difference between the "Hume-Rothery" binding and that which is found in the elements. A. J. M.

Atomic rearrangement process in the alloy Cu_3Au . C. SYKES and F. W. JONES (Proc. Roy. Soc., 1936, A, 157, 213—233).—Experimental data relating to the effect of at. rearrangement on the energy content of Cu_3Au are compared with those predicted by the theories of Bragg and Williams (A., 1934, 954) and of Betho (A., 1935, 1193) and Peierls (A., 1936, 782, 1196). The last-named theory gives the best approximation. From the deduction that the energy of any atom is fixed only by the identity of its neighbours within two at. distances, it follows that a large proportion of the energy of the ordering process is released when the regions of consistent order have reached a length of 5×10^{-7} cm. On the other hand, the electrical resistance of the alloy begins to diminish when the ordered regions are about 5×10^{-7} cm. long. L. L. B.

Methods for the examination of thermal effects due to order-disorder transformations [in alloys]. C. SYKES and F. W. JONES (J. Inst. Metals, 1936, 59, Advance copy, 469—492; cf. A., 1935, 576).—Apparatus is described for making measurements while the temp. is continuously varied. The specimen in the form of a hollow cylinder is mounted inside and thermally insulated from a Cu cylinder and can be heated independently by means of an internal nichrome coil. The whole is placed in an evacuated SiO_2 tube and by suitable adjustment of the current the temp. of the specimen is made to follow a definite wavy curve which intersects the heating curve of the Cu at a no. of points. In this way a sp. heat-temp. curve is obtained which includes the heat effects of any transformation superimposed on the normal C_p - T curve. Values of sp. heat at any temp. and of the direct energy content may be obtained. Examples of its use with Cu_3Au and β -brass are given. A. R. P.

Influence of temperature on potential-concentration relations for binary alloys. G. TAMMANN and H. WARRENTRUP (Z. anorg. Chem., 1936, 230, 41—42).—In alloys forming continuous series of mixed crystals the electrode potential is independent of the composition of the electrode over a wide range, if the temp. is below that at which internal diffusion can occur (Ag-Au, Tl-Pb at room temp.). At temp. high enough to permit diffusion ($>300^\circ$ for Ag-Au, $>250^\circ$ for Tl-Pb) the potential varies continuously with composition. Curves are given to illustrate the effect of temp. in the case of alloys yielding a eutectic, those giving intermetallic compounds, and for the special cases of Zn-Cu and Cu-Ag-Au. F. L. U.

Reactivity of alloys during transformations in solid state. II. J. A. HEDVALL and U. ROSEN (Z. anorg. Chem., 1936, 229, 413—417; cf. A., 1932, 574).—The rate of oxidation of CoSn undergoes a sudden increase at 517—519°, corresponding with the temp. of phase transformation. AgCd similarly shows a max. rate at 432—434°. J. S. A.

Stability of solid solutions of ferrous and cobaltous oxides. J. BÉNARD (Compt. rend., 1936, 203, 1356—1359).—FeO and CoO form a complete series of solid solutions, with a linear variation of the X-ray parameter. The temp. at which the reaction $4\text{FeO} = \text{Fe} + \text{Fe}_3\text{O}_4$ is reversible (570°) increases to 880° for $3\text{FeO} + \text{CoO}$, remains approx. const. with increasing [CoO], and then falls. Mixtures richer in CoO form solid solutions of Fe_3O_4 , Fe_2O_3 , and CoO, together with Co. H. J. E.

Investigation by emanation method of changes in mixtures of oxides during transition to compounds. H. KITTEL (Z. physikal. Chem., 1936, 178, 81—92).—The effect of continued heating on the emanating power, E , of Fe_2O_3 and equimol. mixtures with ZnO, MgO, BeO, and CuO, all rendered radioactive by addition of radio-Th, has been examined. In the temp. region in which active intermediate reaction products are formed (cf. A., 1936, 1216) E rises, but on crystallisation of the final product falls again. The reactivity of the Fe_2O_3 is greater the lower the temp. at which it has been prepared. E is considerably affected by the expulsion of traces of H_2O at the higher temp. If Fe_2O_3 or a ZnO- Fe_2O_3 mixture is heated at const. temp. below 700° E remains steady but fluctuates at higher temp. R. C.

Lower limit of the formation of mixed crystals of the new type. A. POLESICKI (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 65—66; cf. Chlopin and Nikitin, A., 1930, 149).—No mixed crystals of KClO_4 - PbSO_4 are formed when KClO_4 is crystallised from saturated solutions of PbSO_4 in NaNO_3 . O. D. S.

Molecular heat of methane in solid mixtures of methane and krypton. A. EUCKEN and H. VEITH (Z. physikal. Chem., 1936, B, 34, 275—299).—From measurements of the mol. heat of CH_4 -Kr mixed crystals at 12— 80° abs. the mol. and rotational heats of CH_4 in the crystals have been calc. The anomaly exhibited by pure CH_4 at 20.6° decreases with increasing proportion of Kr and for 30—50% Kr the rotational heat rises continually with temp.; for the

highest proportion of Kr (72%) there is a max. again at about 22°. Above 30° for all the mixtures and for pure CH₄ the rotational heat is approx. 3R/2. The results indicate that in the solid state, but not in the gaseous state, the three modifications of CH₄ are able to pass directly one into another. It appears that the potential energy of CH₄ rotating in the crystal is negative relative to that of the corresponding free rotator and rises numerically with temp.; an explanation is suggested. Light is thrown on the anomaly at 20·6° by supposing that instead of ascribing independent rotational degrees of freedom to the individual mols. torsional waves, resulting from the coupling of the rotators, may be assumed to be propagated through the whole solid, taking over the role of individual degrees of freedom. This furnishes a possible mechanism for the transformation of potential into rotational energy when a certain temp. is reached.

R. C.

Demixing in aqueous salt solutions. H. G. B. DE JONG and L. T. VAN ZIJP (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1103—1106; cf. A., 1935, 1320).—Demixing has been observed in a no. of solutions in which double decomp. is involved.

O. D. S.

Solubility in alkalis of some phenolic derivatives.—See A., II, 21.

D₂O and H₂O as solvents for optically active materials. H. ERLÉNMEYER and H. SCHENKEL (Helv. Chim. Acta, 1936, 19, 1381—1382).—The val. of $[\alpha]_D^{20}$ for NMePr²PhBz·NO₃ is slightly greater for aq. solutions than for solutions in D₂O (90·8%).

J. W. S.

Theory of concentrated solutions. XIV. Solubilities in mixtures of two miscible solvents. J. MAHEU (Bull. Soc. chim. Belg., 1936, 45, 667—675).—The solubilities of picric acid, anthracene, anthraquinone, C₁₀H₈, NHAcPh, aceto-*p*-toluidide, and I have been determined (mainly at 25°) in various complete series of homogeneous binary mixtures. These mixtures involve the solvents C₆H₆, PhMe, PhCl, PhBr, CCl₄, CS₂, Et₂O, COMe₂, CHCl₃, C₆H₁₄, PhNO₂, NH₂Ph, cyclohexane, H₂O, EtOH, MeOH, and PrOH. Some of the results obtained afford no evidence of a parallelism between the solubility curves and the saturated v.p. curves for the corresponding mixtures. Solubility curves with maxima, minima, points of inflexion, etc. have been obtained and are interpreted in terms of compound formation between the solvents or between the solute and one of the solvents. Solubility curves for binary mixtures which are characterised by a crit. solution temp. (*T*) generally exhibit max., irrespective of whether the solute raises or lowers *T*.

J. G. A. G.

Solubility of gases in molten metals. H. VON WARTENBERG (Z. Elektrochem., 1936, 42, 841—845).—Published work is reviewed and evidence for the formation of gas-metal compounds adduced.

E. S. H.

Diffusion of gases through metals. J. S. WANG (Proc. Camb. Phil. Soc., 1936, 32, 657—662; cf. A., 1936, 281, 1062).—Consideration is given to a surface process in which atoms diffusing to the surface from inside the metal combine with atoms adsorbed on

the surface, forming mols. which evaporate into the gas phase. In terms of this and the reverse process certain apparent anomalies in experimental data can be explained.

A. J. E. W.

Rate-determining step in the diffusion of hydrogen through palladium. A. FARKAS (Trans. Faraday Soc., 1936, 32, 1667—1679; cf. A., 1933, 1260).—The rate of diffusion of H₂ through a Pd disc into a vac. has been measured at different temp. between 20° and 320°. By using para-H₂ and measuring the rate of para-ortho conversion on both sides of the disc, it is shown that although the two sides may have entirely different catalytic activities, the rate of diffusion is independent of its direction. The primary processes occurring are (1) sorption of H₂ involving dissociation, (2) transfer of at. H through the Pd, (3) desorption of H₂. Heats of activation for these processes are calc. Under the experimental conditions used, sorption is the rate-determining process. H₂ diffuses slightly more rapidly than D₂.

F. L. U.

Solubility of deuterium and hydrogen in solid palladium. II. A. SIEVERTS and W. DANZ (Z. physikal. Chem., 1936, B, 34, 158—159; cf. A., 1936, 25).—The solubilities have been determined at 1 atm. between 20° and 350°.

R. C.

Adsorption of carbon monoxide on zinc oxide. W. E. GARNER and J. MAGGS (Trans. Faraday Soc., 1936, 32, 1744—1748).—Adsorption isotherms for CO on ZnO have been determined between —78° and 35° and heats of adsorption calc. The adsorption isobar shows no discontinuity, and the conclusion is reached that discontinuities occur only in the case of adsorbents where capillary flow is present.

Adsorption of molecular and atomic iodine on quartz glass. P. HOLEMANN and A. BRAUN (Z. physikal. Chem., 1936, B, 34, 381—395).—The adsorption of I vapour has been measured at 150—1000° and consens. of $1·7 \times 10^{-5}$ and $3·3 \times 10^{-5}$ g. per c.c. The adsorption falls with rising temp., and at a given temp. cc *d* of the vapour. From the variation with temp. at 150—400° the calc. mol. heat of adsorption of mol. I is 1·2 kg.-cal. Above 850° the I is adsorbed almost exclusively as atoms, the lower limit of the heat of adsorption being ~15 kg.-cal. The active surface for at. adsorption is << than for mol. adsorption, showing that the atoms are mainly adsorbed at special centres, whilst mol. adsorption occurs fairly uniformly over the whole surface. The v.p. of I at 15·21° is 0·120 mm.

R. C.

Adsorption on ionic lattices. I. M. KOLTHOFF (J. Physical Chem., 1936, 40, 1027—1040).—Various types of adsorption on ionic ppts. are discussed.

F. L. U.

Adsorption of complex [metal]-ammine ions by silica gel. L. H. REYERSON and R. E. CLARK (J. Physical Chem., 1936, 40, 1055—1062; cf. A., 1930, 991).—Adsorption isotherms for complex Ag-NH₃ and Cu-NH₃ ions on undialysed and electro-dialysed SiO₂ gel have been determined. Adsorption increases with rise of *p_n* from 8 to 9·6, and is strong at very low consens.

F. L. U.

Sorption properties of mixed catalysts. I. Sorption of ammonia on ammonia catalyst and the role of the promoter. M. J. KAGAN, N. M. MOROZOV, and O. M. PODUROVSKAJA (*Acta Physicochim. U.R.S.S.*, 1936, 5, 491—508).— NH_3 is adsorbed by Al_2O_3 at 400—740°, the amount adsorbed decreasing with rise of temp. The heats of adsorption are 30,000 and 18,000 g.-cal when the adsorbed NH_3 amounts to 2 and 6 c.c. per g. of Al_2O_3 , respectively. Above 500° the adsorbed NH_3 decomposes into H and NH_2 , which is retained in the adsorbed layer. The addition of K_2O to Al_2O_3 reduces the heat of adsorption and the adsorption capacity. From data for mixtures of Fe and Al_2O_3 , with and without K_2O , it is inferred that Al_2O_3 , by adsorbing NH_3 , inhibits, and that K_2O , by reducing the adsorption capacity of Al_2O_3 , promotes, the catalytic action of Fe in the synthesis of NH_3 . C. R. H.

Adsorption layers in disperse systems. XIV. Surface phenomena in processes of crystallisation. Effect of adsorption layers on the localised crystallisation of silver. N. N. SERB-SERBINA. **XV. Effect of adsorbed layers on the crystallisation of calcium sulphate.** N. N. SERB-SERBINA and V. G. DUBINSKI (*J. Phys. Chem. U.S.S.R.*, 1934, 5, 1186—1189, 1190—1198).—XIV. The relative quantities of Ag formed in the reduction of ammoniacal AgNO_3 by glucose in presence of surface-active substances and hydrophilic colloids were measured. Surface-active substances (*e.g.*, *o*-cresol and aq. NH_3) do not affect the localised crystallisation. Hydrophilic colloids decrease the amount. Adsorption layers of such colloids render the nuclei passive and decrease the rate of crystallisation. Adsorption of ions on the micelles increases the no. of crystal nuclei and the dispersity.

XV. The crystallisation of CaSO_4 in glass, Ag, and paraffin-coated vessels in presence of surface-active substances and hydrophilic colloids was studied. CaSO_4 crystallises in greater quantity on a hydrophobic than on a hydrophilic surface under conditions of quiet growth. Almost all additions increase the local crystallisation. Hydrophilic colloids raise the limit of supersaturation and, under the above conditions, decrease the dispersity. CH. ABS. (e)

Theory of negative adsorption of Debye-Hückel electrolytes. K. ARIYAMA (*Bull. Chem. Soc. Japan*, 1936, 11, 687—691).—Mathematical. R. S.

Chemisorption on charcoal. VIII. Influence of temperature on (a) catalytic oxidation of salts, (b) catalytic decomposition of hydrogen peroxide. A. KING (*J.C.S.*, 1936, 1688—1692; cf. A., 1935, 1069).—C activated in O_2 exerts a max. catalytic effect on the oxidation of $\text{K}_4\text{Fe}(\text{CN})_6$, Na_3AsO_3 , KNO_2 , and quinol when the temp. of activation (*t*) is in the region of 450°, and a min. effect when *t* — about 850°. In the catalytic decomp. of H_2O_2 the activity is max. for *t* = 900° and min. for *t* = 450°. The results are interpreted on the assumption of the existence of at least two surface oxides of C. F. L. U.

Effect of dilute hydrochloric acid on surface tensions of aqueous salt solutions. J. W. BELTON (*Trans. Faraday Soc.*, 1936, 32, 1717—1721; cf. A.,

1935, 1317).—The presence of HCl at 0.1 *M* produces a lowering of the surface tension of aq. solutions of LiCl , CaCl_2 , SrCl_2 , BaCl_2 , NaClO_4 , and $\text{Na}_2\text{S}_2\text{O}_6$. The effect increases with increasing salt concn. The amount of H_2O adsorbed at the surface of the ternary solutions is calc. from the Gibbs equation. F. L. U.

Effects of sodium chloride and aniline hydrochloride on surface tensions and partial vapour pressures of aqueous aniline solutions. J. C. SPEAKMAN (*J.C.S.*, 1936, 1662—1668; cf. A., 1935, 930).—Surface tensions and partial v.p. of NH_2Ph have been measured for aq. solutions of NH_2Ph containing NaCl , $\text{NH}_2\text{Ph.HCl}$, and $\text{NaCl} + \text{NH}_2\text{Ph.HCl}$, and surface adsorptions have been estimated. The max. adsorption of NH_2Ph is not affected by NaCl , but is diminished by $\text{NH}_2\text{Ph.HCl}$. The results are discussed from the point of view of the influence of the salts on the solubility of NH_2Ph . F. L. U.

Surface films of resinols and allied substances. F. A. ASKEW (*J.C.S.*, 1936, 1585—1592; cf. A., 1935, 974).—Surface pressure and surface potential measurements of 18 compounds of, or related to, the resinol group have been made, and the results compared with similar data for compounds of known structure. The amyryns and other mono-OH compounds give mol. areas consistent with accepted formulæ with OH in the position corresponding with the 3-position in the sterol formula. Data for CO- and CO_2H -substituted compounds are also consistent with their allotted formulæ. The behaviour of $(\text{OH})_2$ -compounds, especially those related to betulin, is difficult to interpret. Compounds having two or more widely separated polar groups may be attached to H_2O by only one of them if it possesses a much greater H_2O -attracting power than the others, but may be caused to lie flat in the surface if the former is weakened, *e.g.*, by acetylation. The phenomenon of contraction, shown by many of the films, is discussed. F. L. U.

Surface energy in saturated phases. N. F. LASCHKO and B. G. PETRENKO (*Ukrain. Chem. J.*, 1936, 11, 270—273).—Theoretical. R. T.

Unimolecular films of nerve proteins.—See A., III, 56.

Multimolecular films : mixed films with two or more components. I. Fatty acids and non-polar substances. R. J. MYERS and W. D. HARKINS (*J. Physical Chem.*, 1936, 40, 959—971).—By means of apparatus previously described (this vol., 26) surface pressure-mol. area curves for films of myristic (I), pentadecic (II), stearic (III), and oleic (IV) acids mixed with varying amounts of $\text{C}_{14}\text{H}_{30}$ or Nujol on 0.01*N*-HCl have been determined. Addition of Nujol to (III) facilitates collapse at a lower pressure, but the areas at zero compression are not affected. On the other hand, for (I), (II), and (IV) areas at zero compression are considerably larger than those of the pure acids, and the form of the curves is markedly changed. F. L. U.

Unsupported starch films. W. SECK and R. BREM (*Kolloid-Beih.*, 1936, 45, 99—148).—The properties of starch films have been studied with special reference to anisotropy. In general the films consist of an inner unoriented mass enclosed between

oriented outer layers. The degree of orientation is decreased with increasing concn. and increasing thickness of the film. The influence of η and of the method of prep. has also been studied. E. S. H.

Quantitative spreading of fibrinogen in uni-molecular films. L. FOURT and A. M. PERLEY (Proc. Soc. Exp. Biol. Med., 1935, 33, 201—203).—By the use of solutions of fibrinogen containing 9.5% of EtOH, quant. spreading of the protein films on the surface of aq. buffer solutions is obtained, the area per mg. being approx. independent of the amount of protein spread. W. O. K.

Pore diameter of collodion membranes used in ultrafiltration. P. GRABAR and S. NIKITINE (J. Chim. phys., 1936, 33, 721—741; cf. A., 1933, 672; 1932, 691).—The size distribution of the pores has been calc. from the rates of flow of a liquid, under various pressures, through each membrane saturated with an immiscible liquid having a very small interfacial tension with respect to the first. The difference between the min. and the max. pore diameters for membranes from different batches prepared by Elford's method is approx. \propto the mean pore diameter, *d*. The pore distribution for membranes with small vals. of *d* is irregular, but with large vals. of *d*, the distributions are regular. The dispersion curves generally show two or more max. J. G. A. G.

Cryoscopic studies of solutions in formamide. II. F. H. GETMAN (Rec. trav. chim., 1936, 55, 969—978; cf. A., 1936, 561).—F.-p. data for MeOH, EtOH, PrⁿOH, BuⁿOH, BuⁱOH, Bu^tOH, CH₂:CH·CH₂·OH, (CH₂·OH)₂, glycerol, and CH₂Ph·OH show that, with the exception of BuⁿOH and glycerol, which undergo solvation, the alcohols are slightly associated in the more conc. solutions. In dil. solutions the solutes have normal mol. wts. E. S. H.

Present ideas on the conditions of electrolytes in aqueous solutions. J. J. VAN LAAR (Chem. Weekblad, 1936, 33, 759—768).—A presentation of views associated with the author and Ghosh as distinct from those of Debye and Hückel. S. C.

Variation with concentration of apparent molecular volume of certain strong electrolytes. A. KRUIS (Z. physikal. Chem., 1936, B, 34, 1—12).—By *d* and dilatometric measurements the apparent mol. vol., ϕ , of NaCl, SrCl₂, KCl, and NH₄NO₃ in aq. solution has been determined at 25° for a series of concns. The graphs of ϕ against \sqrt{c} are slightly sigmoid, but at the lower concns. the slopes agree with the Redlich-Rosenfeld theory (A., 1931, 1122). R. C.

Equivalent dispersion of strong electrolytes in solution. I. Variation with concentration of equivalent refraction in the visible. A. KRUIS [with W. GEFFCKEN]. II. Physical interpretation of observed effects. III. Variation with concentration of equivalent dispersion in ultra-violet. A. KRUIS and W. GEFFCKEN (Z. physikal. Chem., 1936, B, 34, 13—50, 51—69, 70—81).—I. *n* has been measured for aq. NaCl, KCl, SrCl₂, NH₄NO₃, and Na₂SO₄ at concn., *c*, of 0.01—2*N* at 25° for several $\lambda\lambda$ in the visible. The apparent equiv. refraction, *R*, for NaCl, KCl, and SrCl₂ passes through

a max. with increasing *c*, whilst for NH₄NO₃ *R* decreases almost linearly with increase in *c* from 0.01*N* to 3*N*. The equiv. dispersion, *D*, increases almost linearly with *c* for Na₂SO₄ and decreases linearly with increasing *c* for NaCl, KCl, SrCl₂, and NH₄NO₃. Apart from the max. on the *R*-*c* curves the change of *D* with *c* tends to run parallel with that of *R* with *c* at concns. >1.5*N*. The change in *D* in passing from the dissolved to the cryst. state is the same in sign as that accompanying increasing *c*.

II. The above variation of *D* with *c* is due to the variation with *c* of the characteristic frequency, ν , and the probability of transition of the long- λ ultra-violet halogen band, whilst the dependence of *R* on *c* arises chiefly from the variation of the parameters of bands in the farther ultra-violet. Since the rate of change of the band parameters with increasing *c* appears to vary with the cation and since, also, the position of the long- λ ultra-violet absorption max. of the halogen ion does not vary with *c* or the cation there must be a red shift of the absorption max. towards ν by an amount which increases with *c*. This shift must be ascribed to the Lorentz-Lorenz force increasing with *c*. For NaCl the val. of *D* extrapolated to infinite dilution, *D*_∞, may be represented by a three-term formula, the positive infra-red term of which is to be attributed to the ions reducing the infra-red part of the refraction of the H₂O. The refractometric solution effect is not, however, due solely to the effect of the ions on the infra-red bands of H₂O. Vals. of *D*_∞ have been calc. for various ions. The results show that *D* and *R* run parallel with each other; both are smaller for cations of the noble gas type than for the isosteric noble gases and anions.

III. As *c* increases, *D* in the infra-red increases for Li₂SO₄, NaClO₄, and NH₄F, falls for LiCl, NaCl, CsCl, MnCl₂, NiCl₂, LiOAc, LiBr, RbBr, NaI, and LiCNS, and remains const. for LiClO₃ and NaClO₃. For a given cation the rate of variation of *D* with *c* falls in the order CNS', I' > Br' > Cl', OAc'; the effect of varying the cation is uncertain. R. C.

Interpretation of variation with concentration of equivalent refraction of strong electrolytes. A. KRUIS (Z. physikal. Chem., 1936, B, 34, 82—95).—The change in slope of the equiv. refraction-concn. curve of aq. NaBr, NaCl, KCl, SrCl₂, and Na₂SO₄ at 25° at concns. < *N* is attributed to an effect of the ions on H₂O mols. which are not in their immediate vicinity. This depresses their refractive power by altering their quasicryst. arrangement or degree of polymerisation. R. C.

Optical behaviour of dissolved ions and its significance for the structure of solutions of electrolytes. V. Optical absorption and dispersibility of organic dye ions in aqueous solution. G. KORTUM (Z. physikal. Chem., 1936, B, 34, 255—274; cf. A., 1936, 1197).—Measurements of the absorption of various dyes at concns. of 1—3 × 10⁻³ *M* for several $\lambda\lambda$ have been made to test the validity of Beer's law. Deviations from the law in such dil. solutions are due to micelle formation by the dye ions, which is more marked and more rapidly established the larger are the ions and the less their surfaces are

shielded by hydrophilic groups. The bearing of these results on the connexion between degree of dispersity and the tinctorial properties of dyes is discussed.

R. C.

Physico-chemical properties of electrolytes. I. Relation between physico-chemical and spectral properties of electrolytes. F. VLES (Arch. Phys. biol., 1935, 12, 57—73; Chem. Zentr., 1936, i, 1190).—A discussion (cf. A., 1935, 444).

H. J. E.

Dielectric constants of some dilute solutions of salts. W. M. MAZEE (Physikal. Z., 1936, 37, 914—916).—The dielectric consts. of dil. aq. solutions of KI , $MgSO_4$, $BeSO_4$, $K_3Fe(CN)_6$, $K_4Fe(CN)_6$, and $Ba_2Fe(CN)_6$ were determined. The results agree with the Debye-Falkenhagen equation. In very dil. solutions $MgSO_4$ and $BeSO_4$ have the same dielectric const.

A. J. M.

Rotatory power and structure of electrolytic solutions. I. PEYCHES (Ann. Physique, 1936, [xi], 6, 856—993).—Ionic interaction in electrolytes has been examined over a wide concn. range by a study of the optical activity of the tartrate ion in the alkali and substituted NH_4 tartrates. Data are recorded for conductivity, ultra-violet absorption, and Raman effect from which conclusions are reached relative to the nature and extent of the ionisation. A new effect arising from the difference of size of the anion and cation has been observed and this is discussed in relation to the Debye-Huckel theory. The variation of rotatory power is said to be a linear function of the ionic potential.

N. M. B.

Optical absorption and association of stannous halides in aqueous solution. H. FROMHERZ and H. J. WALLS (Z. physikal. Chem., 1936, 178, 29—36).—The absorption curves have been determined. At sufficiently high concns. or in presence of a sufficient excess of halogen ions the solutions exhibit absorption bands corresponding with co-ordinatively saturated complex ions of the type SnX_4'' . These are less stable than the complexes formed in solutions of Pb halides and with increasing dilution change continuously through unstable intermediate products containing less halogen to simple ions.

R. C.

Complex aquo-arsenate ions with several shells [of solvent molecules]. H. BRINTZINGER and C. RATANARAT (Z. anorg. Chem., 1936, 230, 28—30; cf. A., 1936, 1066).—The ionic wt. of arsenate ions, calc. from dialysis coeffs. determined at different p_H vals., indicates that the no. of H_2O mols. associated with AsO_4''' is 18, with $HAsO_4''$ 6, and with H_2AsO_4' 2 or 3. In the bi- and ter-valent ion the central ion is considered to be surrounded by two and three shells of H_2O mols., respectively.

F. L. U.

Development of ideas in colloid chemistry. H. R. KRUYT (Natuurwetensch. Tijds., 1937, 19, 17—19).—A brief discussion of the similarity between true and colloidal solutions.

S. C.

Colloid chemistry with reference to molecular association. G. MALFITANO and A. HONNELAITRE (Rev. gen. Sci., 1935, 46, 456—465; Chem. Zentr., 1936, i, 1585).—Theoretical.

J. S. A.

General theory of lyophobic colloids. I. H. C. HAMAKER (Rec. trav. chim., 1936, 55, 1015—1026).—Theoretical. The stability of colloids is discussed in terms of the forces of attraction and repulsion between the disperse particles.

E. S. H.

Structure of water envelope of micelles of organic colloids. K. HESS and J. GUNDERMANN (Z. physikal. Chem., 1936, B, 34, 151—157).—Reasons are advanced for rejecting the view that the X-ray diagrams of cellulose and starch are actually the diagrams of a H_2O envelope surrounding the micelles and having the ice structure (A., 1934, 1162).

R. C.

Colloids and the biological effect of radiation. F. ELLINGER (Nature, 1936, 138, 1014—1015).—Results obtained by the action of ultra-violet light on various colloidal substances are recorded. The effect of ultra-violet light on colloids is purely photochemical; it is independent of the electrical charge on the colloids, and when no photochemical action occurs there is no change in this charge. Postulation of a special colloid-chemical theory of the biological action of radiation is unnecessary.

L. S. T.

Colloid structure and infra-red absorption spectra. S. S. BHATNAGAR, P. L. KAPUR, and M. D. RAJPAL (Kolloid-Z., 1936, 37, 281—286).—The infra-red absorption spectra of Fe_2O_3 , As_2O_3 , SiO_2 , SnO_2 , and Au hydrosols have been determined. Sols having particle diameters 0.9—1.3 μ and 1.55—1.75 μ are less and those of diameter 1.3—1.55 μ and >1.75 μ more transparent than H_2O . These differences and the displacement of the absorption bands of H_2O are traced to disturbance of the equilibrium between H_2O , $(H_2O)_2$, and $(H_2O)_3$ by the hydrated colloid particles.

E. S. H.

Absorption and scattering of light in hydrophobic colloids. I. F. B. GRIBNAU (Kolloid-Z., 1936, 77, 289—294).—Theoretical.

E. S. H.

Viscosity problem in organic colloids. Influence of solvent and temperature on the viscosity of cellulose nitrate solutions. W. PHILIPPOFF (Angew. Chem., 1936, 49, 855—857).—Viscosity data are given for solutions of four different kinds of cellulose nitrate in $COMe_2$, $PhNO_2$, and $BuOAc$ over the range -75° to 60° . The results are discussed in relation to solvation.

E. S. H.

Aerosols. I. Conditions of formation. N. N. ANDREEV and S. G. KIBIRKSHCHIS (Kolloid-Z., 1936, 77, 299—301).—Aerosols require a stabiliser as well as disperse phase and dispersion medium.

E. S. H.

Constitution of dilute soap solutions. I. Turbidity phenomenon of soap solutions. P. ERWALL (Kolloid-Z., 1936, 77, 320—333).—Nephelometric investigations of aq. Na stearate, palmitate, myristate, laurate, and oleate show that with increasing concn. the solutions pass through two regions of turbidity; the first is caused by particles of free fatty acid and the second by particles of acid soap. At still higher concns. particles of alkali-rich soap are formed and the turbidity diminishes. With rising temp. the particles lose their cryst. structure; this transformation occurs at temp. < the m.p. of the corresponding fatty acid.

E. S. H.

Electrophoretic mobility of purified tristearin.

I. The acid region, p_H 2 to 7. A. L. ROBERTS (Trans. Faraday Soc., 1936, 32, 1705—1717).—The mobility of the particles in an emulsion of tristearin at 25° in phosphate, phthalate, citrate, and acetate buffers increases continuously with rise of p_H from 2 to 7, the curve being steepest between 6 and 7. At const. p_H the effect of added anions is determined by concn. rather than the nature of the ions, and in solutions of alkali metal chlorides the lyotropic effect is slight. In the absence of extraneous salts, the electrokinetic charge density decreases with increasing p_H , but increases if added salt is present. Explanations are offered. F. L. U.

Fundamental system of organic micelles.

P. A. THIESSEN (Naturwiss., 1936, 24, 763).—It is suggested that the alkali salts of the normal higher fatty acids provide a simple system for studying the properties of org. micelles. Such compounds exist in rhombic and monoclinic forms, the latter being that usually present in colloidal systems. The behaviour towards polarised light and X-rays leads to information concerning the fine structure of the micelles. The sol \rightleftharpoons gel transition is due to a movement of the long C chains in a crystallographically defined plane, resulting in a loosening of the micelle structure, and a sudden change in the state of aggregation of the micelle. The application of electron diffraction to the study of surface conditions of the micelle shows that the surface is occupied to a large extent by polar groups. The results of such investigations with soaps are readily applied to other org. substances containing both polar and non-polar groups. A. J. M.

Condition of dissolved highly polymerised organic compounds, especially cellulose. I, II. G. SAITO (J. Soc. Chem. Ind. Japan, 1936, 39, 351—353B).—The assumption that long-chain mols. behave independently of one other in dil. solution is subjected to criticism. A. G.

Diffusion of compounds of high mol. wt. and related compounds. V—IX. M. TANGUCHI and I. SAKURADA (J. Soc. Chem. Ind. Japan, 1936, 39, 333B, 333—330B, 335—336B, 336—337B, 337—338B; cf. A., 1936, 286).—V. The diffusion coeff. (D) of mixtures is discussed from a theoretical point of view.

VI. The relation derived in V is shown to hold for solutions containing two or more of glucose penta-acetate, cellobiose octa-acetate, quinol, cellulose-dextrin acetate (I), and secondary cellulose acetate (II) in MeOAc at 23°.

VII. D for two fractions of (I) in MeOAc has been determined at 24.7—25°. The same val. is obtained when cellulose nitrate is dissolved in the solvent to an extent such that η is increased 30 times.

VIII. D has been determined for fractions of (II) in MeOAc at 16.5—21.5°.

IX. If a spherical mol. is assumed, the mol. radius (r) of fractions of (II) = 53—60.5 Å. and the mol. wt. = 9400—10,000, i.e., a polymerisation of approx. 40 glucose residues. These vals. are approx. 0.5—0.33 of those derived from osmotic data. If the mol. is regarded as a fibril with the long axis = 12 Å. (Staudinger), the degree of polymerisation = 90—120, in agreement with osmotic data. R. S. B.

Study of the solute state of natural high polymerides. M. ULMANN (Angew. Chem., 1936, 49, 926—928).—An isothermal distillation method for determining osmotic pressure is described which gives results in agreement with those obtained by the membrane method and may be used with very dil. solutions where the membrane method fails. The method enables a distinction to be drawn between normal association, when the mols. are grouped together, and special association, due to the formation of a new type of mol. entity. F. C. B. M.

Deformation of dissolved polystyrene molecules on streaming. R. SIGNER and C. SADRON (Helv. Chim. Acta, 1936, 19, 1324—1327; cf. A., 1933, 902).—The streaming anisotropy and extinction angle of solutions of polystyrene in cyclohexanone and tetralin show a discontinuous increase at a certain val. of the streaming gradient (G), which depends on the concn. and solvent. The discontinuity occurs at a const. val. of the product $G\eta$. The phenomenon is attributed to a deformation of the chain-like solute mols., superposed on their orientation in the streaming liquid. H. J. E.

Structure of platinum sols. II. The platinum hydroxosols. W. PAULI and A. BACZEWSKI (Monatsh., 1936, 69, 204—233; cf. A., 1935, 1202).—The conductivity, κ , and the NaOH and Ba(OH)₂ conductometric titration vals. for Pt hydroxosols increase towards equilibrium vals. with time. Boiling accelerates the process. The difference between the observed conductivity and that calc. from the $[H^+]$ is ascribed to the formation of complex Pt acids and Pt platinates on the colloid surface. Pure conc. Pt hydroxosols prepared by electro-decantation, and also the supernatant liquid and coagulate obtained therefrom by freezing, have been similarly investigated. When two such sols are mixed, κ etc. increase towards new equilibrium vals. owing to the formation of ionogenic groups and reactive oxides on the particle surface. Pt hydroxosol is completely coagulated by reduction with H₂, or by long boiling, but is unaffected by CO₂, whilst treatment with HHal does not yield halogen-sols. R. S.

Viscosimetric investigation of the structure of ferric hydroxide sols. IV. Influence of alcohols. I. B. REVUT (Acta Physicochim. U.R.S.S., 1936, 5, 537—548).—Alcohols lower the conductivity and $[Fe^{III}]$ of FeCl₃ solutions without affecting the p_H to any great extent; the extent of the lowering increases with the no. of C atoms. The coagulating effect of alcohols on Fe(OH)₃ sols is attributed to a reduction in $[Fe^{III}]$ in the intermicellar liquid, followed by a lowering of the ϵ - and ζ -potentials. C. R. H.

Transference numbers of colloidal "ferric hydroxide." J. W. MCBAIN and W. M. THOMAS (J. Physical Chem., 1936, 40, 997—1004).—Transport nos. of a "Fe(OH)₃" sol, previously described (A., 1932, 994; 1933, 567), have been determined by the analytical and moving boundary methods, which give the same results. In the sol used, only 10.5% of the total Cl functioned as anion, the remainder travelling with the Fe. The physicochemical properties of the sol are summarised. F. L. U.

Coagulation of sols by electrolytes. VI. Cupric ferrocyanide sol. H. B. WEISER and W. O. MILLIGAN (J. Physical Chem., 1936, 40, 1071—1082; cf. A., 1936, 157).—Both above and below the pptn. concn., adsorption of cations is the displacement of H ions in a $\text{Cu}_2\text{Fe}(\text{CN})_6$ sol stabilised by $\text{H}_4\text{Fe}(\text{CN})_6$; this appears to be due to the fact that most of the H ions of the diffuse outer layer are in the intermicellar liquid. The adsorption of cations is largely an exchange adsorption. The behaviour of $\text{Cu}_2\text{Fe}(\text{CN})_6$ sol towards electrolytes is essentially similar to that of sols of S, As_2S_3 , and hydrous oxides.

F. L. U.

Perfection and agglomeration of crystalline precipitates on ageing. I. M. KOLTHOFF (Science, 1936, 84, 376—377).—The ageing of BaSO_4 and AgCl at room temp. substantiates the view that the classical type of ageing (so-called Ostwald ripening) is of subordinate significance at room temp. Fresh ppts., although cryst., are highly imperfect, and, especially during the early stages of ageing in the mother-liquor, a very fast perfection process occurs as a result of recrystallisation without always being accompanied by pronounced changes of the external surface (Ostwald ripening). All factors which decrease the solubility of the ppt. inhibit the speed of perfection and *vice versa*. This recrystallisation occurs in a liquid film around the primary particles, the surface of which is very irregular and contains spots of various activities, and results in a self-digestion and self-perfection of the primary particles. The speed of perfection is determined not by the solubility of the ppt. in the bulk of the solution but also by the solubility in the liquid film around the particle. Agglomeration and a cementing process, which is irreversible and results in a decrease of total surface of the ppt., also accompany recrystallisation.

L. S. T.

Hydration and structure of starch. G. CEN-TOLA (Atti R. Accad. Lincei, 1936, [vi], 617—622).—Aq. v.p.-temp. curves have been measured for two samples of starch in which the moisture content varied from 0 to 30%. Two stages of dehydration are observed. The H_2O lost in the second slower stage is supposed to enter into the crystal lattice, but since the v.p. varies continuously with the composition of the solid phase, it cannot be H_2O of crystallisation.

O. J. W.

Colloidal copper and alcoholic aluminium oxide gel. M. A. MILLER (Kolloid-Z., 1936, 77, 310—312).—Finely-divided Cu, reduced from aq. CuCl_2 by Al, is peptised to a sol by 95% EtOH; the particles are slowly transformed into $\text{Cu}(\text{OH})_2$. Al and Cu in contact in 95% EtOH form $\text{Al}(\text{OH})_3$ gel.

E. S. H.

Ionic exchange produced by the addition of nitrates of thorium, hexol, and cerium to the negative sol of silver iodide. J. GILLIS and J. ECKHOUT (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1099—1103).—After coagulation of an AgI sol by the addition of $\text{Th}(\text{NO}_3)_4$ or hexol nitrate part of the NO_3^- ions is removed with the ppt. The amount removed is < in the case of lyophilic sols. After coagulation with $\text{Ce}(\text{NO}_3)_3$ the whole of the NO_3^- is found in the solution.

O. D. S.

Intracellular swelling of cellulose in water. I. SAKURADA and K. HUTINO (Kolloid-Z., 1936, 77, 346—351).—The formation of " H_2O -cellulose" (I) by treating Na-cellulose-I with H_2O is described. The lattice consts. of (I) have been determined and it appears that H_2O penetrates into the lattice. (I) is stable in H_2O and mineral acids at room temp., but when dried at 25° it is converted into cellulose hydrate (II). (I) swells in H_2O more strongly than (II).

E. S. H.

Hydrophilic properties of cellulose. I. Hydration problem. K. KANAMARU. II. Hydrophilic properties of electropositive cellulose fibres. K. KANAMARU and T. NAKAMURA (Kolloid-Z., 1936, 77, 351—356, 357—365).—I. When cellulose and its derivatives are kept in H_2O the ζ -potential falls in accordance with $-d\zeta/dt = a(\zeta - \zeta_\infty)$, where ζ_∞ is the value of ζ which is asymptotically approached. The results show that $\zeta_0 - \zeta_\infty$ is a measure of the capacity, $\zeta_0 - \zeta$ of the degree, and $-d\zeta/dt$ of the velocity of hydration.

II. Cellulose treated with adsorbed $\text{Al}(\text{OH})_3$ gives reduced hygroscopicity and enhanced electrical insulating properties. The best conditions for treating cellulose so as to improve these properties without impairing mechanical strength have been determined.

E. S. H.

Heterogeneous equilibrium of protein solutions. I. Activity coefficients and membrane equilibrium in mixtures of gelatin and salts. N. R. JOSEPH (J. Biol. Chem., 1936, 116, 353—370).—The effect of gelatin and other proteins on the activity coeff. of ZnCl_2 has been determined electrometrically and also on the basis of data relating to membrane equilibria and solubility.

P. G. M.

Digestion of peptised silver bromide. A. RANDOLPH (Z. Physik, 1936, 103, 414—420).—AgBr in gelatin solution was submitted simultaneously to peptising and ripening processes. Emulsions of different grain size were produced, superior to those obtained by ordinary methods. The sensitivity of an emulsion depends not only on the AgBr grain size but also on the physico-chemical state of the grains.

A. E. M.

Retardation of thixotropic solidification by amino-acids. W. HELLER (Compt. rend., 1936, 203, 1507—1509).—Changes occurring during the centrifuging of thixotropic Fe_2O_3 sols, with and without added glycine or glucose, are described and discussed.

A. J. E. W.

Perchlorates and the lyotropic series. P. GIBERT and A. DURAND-GASSELIN (Bull. Soc. chim., 1936, [v], 3, 2237—2239).—The proximity of ClO_4^- to I' and CNS' in the lyotropic series is illustrated by the fact that aq. solutions of $\text{Mg}(\text{ClO}_4)_2$ dissolve gelatin, agar, sol. starch, glycogen, gluten, gliadin, and (in part) edestin, and form mucilages with rice and carob starch, in the cold. Silk is dissolved slowly on heating, whilst fibrin, casein, ovalbumin, and wool are unaffected. COMeEt is completely miscible with dil. aq. $\text{Mg}(\text{ClO}_4)_2$.

F. L. U.

Gelation of bentonite suspensions. G. BROUGH-TON and L. SQUIRES (J. Physical Chem., 1936, 40,

1041—1053).—The influence of concn., temp., and addition of EtOH on the rate of gelation of bentonite suspensions has been studied. The results are consistent with the view that setting is due to the formation of random structures by direct aggregation of the particles without any solvent sheath.

F. L. U.

Electrodialysed gels of silica, alumina, ferric hydroxide, and their mixtures. II. Moisture retention capacity of the gels saturated with different cations. P. B. BHATTACHARYYA and K. GANGULY (J. Indian Chem. Soc., 1936, 13, 547—554; cf. A., 1936, 796).—The pure gels take up most H₂O when saturated with Na⁺, whereas binary mixtures have the greatest capacity when saturated with Mg⁺⁺. The absorption accords with the Freundlich isotherm and retention of H₂O is a max. at SiO₂/Fe₂O₃(Al₂O₃) = 1.4.

R. S.

Diffusion of water through agar jellies. L. ZOBRIST and M. GRUBER (Kolloid-Z., 1936, 77, 333—342).—The influence of H₂O-v.p., temp., concn. of agar, and relative positions of agar and H₂O has been determined. Diffusion increases at a rate which is > ∞ the saturation deficiency; with rising temp. the diffusion decreases for const. saturation deficiency. The influence of agar concn. varies according to the direction of diffusion of the H₂O.

E. S. H.

Liquefying of sodium hydroxide-albumin gels. J. L. DONNELLY (Kolloid-Z., 1936, 77, 343—345).—When egg-white is treated with NaOH the electrical conductivity rises and then falls; the viscosity and surface tension are lowered, the vol. increases, the temp. rises, and the basic reaction towards phenolphthalein diminishes. These changes are traced to hydrolysis of the hydrated proteinates and dissolution of the Na salts of the degradation products.

E. S. H.

Determination of equilibrium in deuterium exchange reactions in which molecules with numerous atoms are involved. K. WIRTZ (Z. physikal. Chem., 1936, B, 34, 121—140).—Theoretical. The equilibrium consts., *K*, of exchange reactions such as $A + B \rightleftharpoons C + D$ and their variation with temp., *T*, can be calc. from the vibrational spectra and structure of the mols. statistically by using the relation $\log_e K = RT \log_e (\Sigma_C \Sigma_D / \Sigma_A \Sigma_B)$, where Σ are partition functions, assuming that for polyat. mols. translation and rotation are fully excited and vibration not excited at all, and that the changes in the moments of inertia and masses of the heavy mols. caused by interchange of H and D can be neglected; the zero-point energy of vibration is taken to be $h\nu/2$. A method of calculating the contribution to *K* of the symmetry nos. of complex mols. is described. Calculation of the distribution ratios of H and D for various interchange reactions on these lines has given results agreeing with published data.

R. C.

Dissociation constants. A. G. OGSTON (J.C.S., 1936, 1713; cf. A., 1936, 765).—Dissociation consts. of the following have been determined: C₆H₂Cl₃·OH, C₆Cl₅·OH, C₆H₂Br₃·OH, C₆Br₅·OH, hypoxanthine, 7- and 9-methylhypoxanthine, inosine, adenine, adenosine, α-bromopropionyltyrosine, tyramine.

F. L. U.

Physico-chemical properties of solutions of sulphite-chromium complexes. A. L. ZAIDES (J. Gen. Chem. Russ., 1936, 6, 1325—1334).—The sp. conductivity κ and the intensity of coloration *I* of violet Cr₂(SO₄)₃ solutions increase with rising [Na₂SO₃]; the Cr is present chiefly as cation with low, and as anion with high, [Na₂SO₃]. In the case of green Cr₂(SO₄)₃ solutions the vals. of κ and *I* pass through a min. at 0.7 mol. of Na₂SO₃ per Cr atom. The conversion of violet into green Cr₂(SO₄)₃ solutions is represented as $[\text{Cr}(\text{H}_2\text{O})_6]_2(\text{SO}_4)_3 + \text{H}_2\text{O} \rightarrow [\text{Cr}(\text{H}_2\text{O})_4(\text{SO}_4)_2]' + \text{H}^+ + [\text{Cr}(\text{H}_2\text{O})_5\text{OH}]'' + \text{SO}_4''$.

R. T.

Capacity of complex cations to form double shell complex compounds. Single and double shell complex ions of triferric-, tricobaltic-, and trichromic-hexa-acetate-dihydroxy-ions in solution. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1936, 230, 176—180; cf. this vol., 94).—The existence of cations of the type $[\text{M}_3(\text{AcO})_6(\text{OH})_2]'$ (M = Fe, Co, Cr), and of double shell anions $\{[\text{M}_3(\text{AcO})_6(\text{OH})_2]_2\}^-$ (Z = SO₄, HPO₄, HAsO₄) in aq. solution is inferred from measurements of dialysis coeffs.

F. L. U.

Chemistry in liquid sulphur dioxide. G. JANDER and K. WICKERT (Z. physikal. Chem., 1936, 178, 57—73).—The solubilities and conductivities of solutions in SO₂ of various inorg. substances are recorded. Assuming that the solvent dissociates in accordance with the scheme $2\text{SO}_2 \rightleftharpoons \text{O}\cdot\text{SO}_2'' + \text{SO}''$, SO₃'' + SO'', thionyl compounds, giving the SO'' ion, should in SO₂ be analogous to acids, whilst sulphites, giving the SO₃'' ion, should be analogous to bases. Such reactions as Na₂SO₃ + SOCl₂ = 2NaCl + 2SO₂ are then comparable with neutralisation. Precipitation, solvolytic, and oxidation-reduction reactions have also been studied. The compounds $[(\text{NEt}_3)_2\text{SO}]\text{SO}_3$ and $[(\text{NHET}_2)_2\text{SO}]\text{SO}_3$ have been obtained by reaction of liquid SO₂ with NEt₃ and NHET₂, respectively.

R. C.

Exchange of hydrogen between ethyl alcohol and calcium deuterioxide. J. C. JUNGERS and K. WIRTZ (Bull. Soc. chim. Belg., 1936, 45, 679—683).—The D content of EtOH vapour after 1—20 hr. contact with Ca(OD)₂ at room temp. has been determined. The observed vals. accord with those calc. on the hypothesis that only the hydroxy-H of EtOH is exchanged. The reaction is complete in <1 hr.

J. G. A. G.

Conditions for a heterogeneous reaction with a gas phase in the case of miscibility of the condensed phases. M. DODÉ (Compt. rend., 1936, 203, 1359—1361).—An approx. calculation is made of the equilibrium pressure in the gas phase, assuming that the components of the liquid phase form an ideal mixture. The system NaNO₃ liq.—NaNO₂ liq.—O₂ is discussed.

H. J. E.

Blackening of cinnabar. C. BROSSET (Naturwiss., 1936, 24, 813).—The conversion of red cinnabar into black metacinnabarite on heating is probably monotropic between 380° and 700°. The black substance produced by the action of visible and ultra-violet light on cinnabar, when examined by the X-ray powder method, shows only lines attributable to

cinnabar. The blackening cannot be due to the formation of metacinnabarite. A. J. M.

Thermal decomposition of calcium carbonates. L. HACKSPILL (Compt. rend., 1936, 203, 1261—1263).—Different pressure-temp curves are obtained for the decomp. of calcite and of artificial cryst. CaCO_3 ; the discrepancy is probably due to difference in crystal size. A. J. E. W.

(A) System sodium and thallium nitrates, chlorides, and sulphates. N. P. LUSHNAJA. (B) Ternary system $\text{KCl-KNO}_3\text{-K}_2\text{SO}_4$. E. I. KUZMINA. (C) Physicochemical conditions of crystallisation of KClO_3 at 0° and -10° . A. I. SASLAVSKI. (D) Binary system $\text{NH}_4\text{Cl-H}_2\text{O}$. E. I. ACHUMOV and B. B. VASSILIEV. (E) System $\text{KCl-Ca(ClO}_3)_2$ at 25° in aqueous solution. V. S. EGOROV. (F) Sodium and potassium carbonates and bicarbonates in aqueous solutions. A. G. BERGMAN, B. B. VASSILIEV, and S. S. SINANI. (G) System $\text{Na}_2\text{CO}_3\text{-K}_2\text{CO}_3\text{-H}_2\text{O}$ at low temperatures. S. S. SINANI and V. N. CHUDJAKOV. (H) System $\text{Na}_2\text{CO}_3\text{-K}_2\text{CO}_3\text{-H}_2\text{O}$ at elevated temperatures. B. B. VASSILIEV. (I) Isotherm of the system $\text{Na}_2\text{CO}_3\text{-K}_2\text{CO}_3\text{-H}_2\text{O}$ at 0° . V. N. KRAT (Trans. State Inst. Appl. Chem. U.S.S.R., 1935, No. 23, 34—63, 63—66, 67—84, 85, 85—96, 97—100, 100—109, 110—117, 117—118).—(A) The equilibrium diagram, based on thermal analysis, is described.

(B) The ternary eutectic is at 318° (K_2SO_4 1, KCl 16.75, KNO_3 82.25%).

(C) The KClO_3 yield can be increased to 92—93 and 94—95% at 0° and -10° , respectively.

(D) Solubility data ($100\text{--}215^\circ$) are recorded.

(E) Solubility data are given.

(F) Methods of separating Na_2CO_3 and K_2CO_3 from the solutions obtained in the production of Al(OH)_3 from Khibin nephelites have been studied.

(G) Solubility data (-30° to 12.6°) are recorded.

(H) The best method of separating Na_2CO_3 and K_2CO_3 is by isothermal evaporation at 125° , when anhyd. Na_2CO_3 separates. CH. ABS. (E)

Ammoniates of uranyl and uranic chlorides. P. SPAOU (Z. anorg. Chem., 1936, 230, 181—186; cf. A., 1934, 613).—Tensimetric study of the systems $\text{UO}_2\text{Cl}_2\text{-NH}_3$ and $\text{UCl}_4\text{-NH}_3$ indicates the existence of compounds of UO_2Cl_2 with 1, 2, 3, 4, and 5 mols., and of UCl_4 with 3, 4, 5, 6, 10, and 12 mols. of NH_3 . The temp. range was -78° to 184° . F. L. U.

Pseudo-binary fusion diagram of monomeric and dimeric dihydroxyacetone. D. TOLLENAAR (Z. anorg. Chem., 1936, 229, 418—422).—The complete equilibrium diagram between the monomeric form, m.p. 83° , obtained by distillation, and the dimeric form, m.p. 117° , obtained by crystallisation from MeOH at -80° has been investigated. By crystallisation from MeOH at 0° , the pseudo-uranyl equilibrium form, m.p. 82° , mol. wt. 95, is obtained. J. S. A.

Influence of the modifications of ammonium nitrate in the three-component system ammonium nitrate-carbamide-resorcinol. K. HRYNAKOWSKI and M. SZMYT (Z. Krist., 1936, 94, 358—366).—F.-p. measurements indicate that the org.

components have no marked effect on the polymorphism of the NH_4NO_3 . The system has two ternary eutectics: one at 74.0° , with 16.0, 18.0, and 66.0, and one at 42.4° with 52.0, 45.5, and 2.5% of NH_4NO_3 , $\text{CO(NH}_2)_2$, and resorcinol, respectively. B. W. R.

Solubility in the system lead chloride-calcium chloride-zinc chloride-water. D. M. TSCHISHKOV and A. S. SCHACHOV (J. Appl. Chem. Russ., 1936, 9, 1387—1393).—Solubility data are recorded for the systems $\text{PbCl}_2\text{-ZnCl}_2\text{-H}_2\text{O}$, $\text{PbCl}_2\text{-CaCl}_2\text{-H}_2\text{O}$, and $\text{ZnCl}_2\text{-CaCl}_2\text{-H}_2\text{O}$, at 25° and 60° . The formation of double salts is suggested by solubility minima in all three systems. R. T.

Double decomposition in absence of a solvent. XXXI. Multi-component mutual systems. A. G. BERGMAN and I. S. DOMBROVSKAJA. XXXII. Stable complex of quinary mutual systems of nine salts. V. P. RADISOVTSHEV (Bull. Acad. Sci. U.R.S.S., 1936, 133—152, 153—192).—Theoretical. Methods of representation of multi-component systems are given. R. T.

Free energy as basis of thermodynamics. J. E. VERSCHAFFELT (Natuurwetensch. Tijds., 1937, 19, 21—23).—Mathematical. S. C.

Application of thermomechanics to electrochemistry. J. E. VERSCHAFFELT (Bull. Acad. roy. Belg., 1936, [v], 22, 1002—1014).—Theoretical. Problems involving the partial molal free energy of electrolytes are considered. R. C. M.

Thermodynamics of the solubility and crystal hydrate formation of the alkali halides. W. D. TREADWELL and A. AMMANN (Helv. Chim. Acta, 1936, 19, 1201—1210).—The solubility (s) of the anhyd. cryst. alkali halides can be calc. from their heats of formation, decomp. potential, and entropy, independently of the degree of dissociation of the solution. A measure of s can also be obtained by assuming that $1/80$ of the lattice energy can be transposed into osmotic work, and subtracting from this the osmotic work which is actually obtainable. The differences between the former and the latter vals. observed with KF , RbF , CsF , LiCl , LiBr , LiI , and NaI are said to afford evidence of the formation of crystal hydrates, whilst the divergences of opposite sign observed with LiF and NaF indicate complex formation. The diminution of the solubility of NaCl in D_2O as compared with H_2O is calc. J. W. S.

Free energy of formation of magnesium oxide and magnesium chloride. W. D. TREADWELL, A. AMMANN, and T. ZURRER (Helv. Chim. Acta, 1936, 19, 1255—1270; cf. A., 1934, 1317).—From the v.-p. curve of Mg , the sp. heat, heat content, and entropy of Mg and MgO have been calc. between 298.1° and 2400° abs. From these data and the equilibrium $\text{MgO} + \text{Cl}_2 \rightleftharpoons \text{MgCl}_2 + 0.5\text{O}_2$ the heat of formation of MgCl_2 at various temp. is calc. The equilibrium in the reaction $3\text{MgO} + 2\text{Al} \rightleftharpoons \text{Al}_2\text{O}_3 + 3\text{Mg}_{\text{gas}}$ has also been calc. for various $[\text{Mg}]$. Various e.m.f. data are shown to be in agreement with the calc. heat of formation of MgO . The e.m.f. of the Mg-Cl_2 combination in molten MgCl indicates that the Mg^+ ion forms stable complexes therein. Anodes of

Au around which O_2 is passed act as Cl_2 electrodes in molten $MgCl_2$ saturated with MgO . J. W. S.

Structure, heat content, and special properties of active substances. II. Surface and heat content of crystalline magnesium hydroxide. R. FRICKE, R. SCHNABEL, and K. BECK (Z. Elektrochem., 1936, 42, 881—889; cf. A., 1935, 574).—The heat of dissolution of $Mg(OH)_2$ ppts. in 3.75*N*-HCl varies with the age and method of prep. of the $Mg(OH)_2$. Energy differences of 850 g.-cal. per mol. are observed. X-Ray examination shows that the difference in energy content is related to large differences in surface. By comparison of these quantities an estimate of the mean surface energy of cryst. $Mg(OH)_2$ has been obtained. E. S. H.

Specific heat of aqueous systems containing sodium, potassium, and magnesium chloride. V. I. NIKOLAEV, A. G. KOTON, and G. F. OGORODNIKOV (Bull. Acad. Sci. U.R.S.S., 1936, 193—214).—Min. sp. heat is found for "eutonic" solutions. R. T.

Heats of formation and of dissolution of isomeric cobaltammines. T. C. J. OVENSTON and H. TERREY (J.C.S., 1936, 1660—1662).—Vals. are given for *cis*- and *trans*- $[Co(NH_3)_4Cl_2]Cl$ and for *cis*- and *trans*- $[Co(en)_2Cl_2]Cl$. Heats of formation are calc. from the observed heats of reaction of the respective compounds with aq. Na_2S . F. L. U.

Heats of combustion of some physiologically important carbohydrate derivatives. H. COLLATZ (Cellulosechem., 1936, 17, 128—129).—The heats of combustion of Ca α -glycerophosphate, Ca hexose diphosphate, and lactaldehyde are 1870, 1612, and 5157 g.-cal. per g., respectively. A. G.

Thermochemistry of oxygen-haemoglobin reaction.—See A., III, 2.

Physico-chemical properties of solutions in liquefied gases. XV. Conductivity of acids and salts in liquid ammonia. E. N. GURJANOVA and V. A. PLESKOV (Acta Physicochim. U.R.S.S., 1936, 5, 509—536).—Vals. of Λ at -40° are recorded for solutions of NH_4NO_3 , NH_4Cl , $NaCl$, NH_4Br , NH_4ClO_4 , $KClO_4$, $AcOH$, $NaOAc$, $KOAc$, HCO_2H , HCO_2Na , $BzOH$, $NaOBz$, H_2S , HCN , $Ca(NO_3)_2$, $Ba(NO_3)_2$, and $Sr(NO_3)_2$. The vals. of Λ_∞ for strong electrolytes obtained by extrapolation are in good agreement with the theory of Fuoss and Kraus; for weak electrolytes the calc. vals. are $<$ the extrapolated vals. The ionic mobilities have been calc., and the low val. for NH_4^+ is attributed to solvation and to the affinity of protons for the NH_3 mol. The val. of Λ_∞ for H_2S suggests that it is monobasic and that in the $(NH_4)_2S$ present in solution, one of the NH_3 groups is more weakly bound than the other, the dissociation being $NH_4SHNH_3 \rightleftharpoons NH_4^+ + SHNH_3'$. The dissociation consts. of weak acids are $>$ the corresponding vals. for aq. solutions. The heat of dissociation of acids in liquid NH_3 is small. C. R. H.

Temperature coefficients of electrical conductivity of electrolytes in methyl and ethyl alcohols. A. G. OGSTON (Trans. Faraday Soc., 1936, 32, 1679—1691).—Limiting conductivities (Λ_0) and dissociation consts. have been determined at 4° ,

15° , and 25° for KCl , $AgNO_3$, $KMeCO_3$, $Net.ClO_4$, NEt_4 picrate, $KOMe$, and HCl in $MeOH$, and for KI , LiI , $KEtCO_3$, NEt_4ClO_4 , NEt_4 picrate, $KOEt$, and HCl in $EtOH$. The temp. coeffs. of Λ_{07} are the more negative (1) the greater is Λ_0 , (2) the lower is the temp., and (3) in the order $EtOH < MeOH < H_2O$. Negative coeffs. in hydroxylic solvents are explained by the effect of electrostriction pressure on viscosity in the neighbourhood of the ions. The mobility of OMe' and OEt' is partly abnormal. Heats of dissociation are calc. F. L. U.

Kinetics of complex formation in non-aqueous solutions, in connexion with conductivity. I. E. J. GORENBEIN (J. Gen. Chem. Russ., 1936, 6, 1230—1233).—The increase in the sp. conductivity of the system $AlBr_3$ - $HgBr_2$ - $EtBr$ with time is said to be due to the reactions $2AlBr_3 + HgBr_2 \rightarrow 2AlBr_3 \cdot HgBr_2 (+EtBr) \rightarrow 2AlBr_3 \cdot HgBr_2 \cdot EtBr \rightarrow [2AlBr_3 \cdot HgBr_2 \cdot EtBr]^+ + Br^-$. R. T.

Basic salt concept in the sexavalent uranium series. P. JOLIBOIS and G. FOURETIER (Compt. rend., 1936, 203, 1263—1265).— $[H^+]$ and electrical conductivity measurements show SO_3 , UO_3 to be the only compound of SO_3 and UO_3 stable in solution. This and other UO_3 compounds may exist in solution as complex acids, UO_3 then having no basic function. A. J. E. W.

Tellurium electrode. O. TOMÍČEK and F. POUPPE (Coll. Czech. Chem. Comm., 1936, 8, 520—531; cf. A., 1934, 1321).—Electrodes prepared by polishing rods of pure Te with emery give, in presence of CO_2 -free air or O_2 , trustworthy vals. of the $[H^+]$ of solutions in the p_H range 2—12. Salt effects have been investigated. The H_2 and Te electrodes are in general approx. equally affected by Na_2SO_4 and $NaCl$, but at $p_H < 5$ the Te electrode is more strongly influenced by $NaCl$. $NaHSO_3$ interferes, but $NaNO_3$, $NaClO_4$, $(NH_4)_2SO_4$, NH_4ClO_4 , and dil. $KMnO_4$ have only small effects and the electrode is a trustworthy indicator in the electrometric titration of H_3PO_4 , $AcOH$, tartaric acid, and $H_2C_2O_4$. The electrode reactions in acid and alkaline solutions are indicated. J. G. A. G.

Temperature coefficients of single electrode potentials. J. SKOTNICKÝ (Coll. Czech. Chem. Comm., 1936, 8, 496—519).—Determinations of the e.m.f., at 15° , 25° , 35° , of cells containing the electrodes $Ag|AgCl|Cl'$, $Hg|Hg_2Cl_2|Cl'$, $Pt|quinhydrone + H^+$, $Ag|Ag'$, and $Hg|Hg_2$, show that the temp. coeff., dE/dT , of the single electrode potentials depends mainly on the activity of the ion controlling the potential of the electrode and on the relative change of this activity with temp. The expression for dE/dT contains a term which is characteristic of the particular electrode and is const. within wide limits of concn. and almost independent of other components of the electrode solution. The temp. coeff. of the standard H_2 electrode is $+0.837$ mv. per 1° , assuming that the thermo-potential of the 3*M*- KCl junction is zero. J. G. A. G.

Effects of corrections for liquid-junction potentials of saturated calomel electrodes on dissociation constants obtained by electrometric titration. W. J. HAMER and S. F. ACREE (J. Res.

Nat. Bur. Stand., 1936, 17, 605—613).—The potential of the 4·1*N*-KCl-HgCl electrode free from liquid-junction potentials is 0·2422 volt on the H scale at 25°. From electrometric titrations of 0·1*M*-malonic acid with 0·1007*N*-NaOH, an estimate has been made of the errors in p_H , dissociation consts., "salting-out coeff.," ionic strength, ionic concn., and H-ion activity arising from neglect of or only partial correction for the liquid-junction potential between saturated KCl and Na malonate buffer solutions. Partial corrections produce larger errors than no corrections. Small errors in p_H produce large errors in dissociation consts. The first and second dissociation consts. (corr.) of malonic acid in Na malonate buffer solutions at 25° are $1·67 \times 10^{-3}$ and $2·51 \times 10^{-6}$, respectively. Their relations to the vals. expected in pure H₂O are discussed.

J. W. S.

Absolute interface potential at an electrode. M. CALVIN (Mem. Manchester Phil. Soc., 1935—1936, 80, 29—32).—The abs. interface potential at —273° has been calc. for a no. of electrodes by carrying out the electrode reaction through an alternative cycle, the energy changes in each step being known. For the normal H₂ electrode, the energy required to transfer one atom of H from the electrode to a solvated H⁺ is $-\frac{1}{2}D_H - I_H + U_H + \phi_H$, where D_H is the heat of dissociation of H₂ at 25°, I_H is the heat of ionisation of H at —273°, U_H is the heat of hydration of H⁺ at 25°, and ϕ_H is the electronic work function of Pt at —273°. The energy, +49,360 g.-cal., is equiv. to an interface potential of +2·14 volts. Analogous cycles for other electrodes are considered. C. R. H.

Potential of iron in hydrochloric acid. L. GURTON (Compt. rend., 1936, 203, 1254—1257).—A study of the variation of the electrode potential of Fe in aq. HCl solutions with time of immersion indicates that the reaction $Fe \rightarrow Fe^{2+} + 2e$ is slow in dil. solutions. Fe adsorbs H⁺ in conc. solutions, and functions as a H₂ electrode. A. J. E. W.

Polarographic study of complex cyanides of nickel and cobalt. G. SARTORI (Gazzetta, 1936, 66, 688—692).—Deposition potentials for Ni and for Co from solutions of NiCl₂ + KCN and of CoCl₂ + KCN indicate that these solutions contain the complexes K₂Ni(CN)₄ and K₄Co(CN)₆, respectively. O. J. W.

Downward shift of p_H caused by addition of glucose to boric acid buffer solutions. P. S. TANG and C. Y. LIN (Science, 1936, 84, 315—316).—Data are tabulated. The effect is reversible.

L. S. T.

Anodic potential of chromium in asymmetric alternating-current electrolysis. I. Method and results. A. GELDBACH and M. SCHLOTTER (Z. Elektrochem., 1936, 42, 889—900).—The influence of superimposed a.c. on the behaviour of a Cr anode in *N*-HCl and *N*-H₂SO₄ during d.c. electrolysis has been determined and is expressed by means of curves.

E. S. H.

Passivity of iron and steel in nitric acid solution. XI, XII. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1936, 15, 64—65, 65—66).—XI. Stirring increases the p.d. between soft steel and a Pt electrode in aq. HNO₃, particularly if [HNO₃] is low; it also makes passivation difficult, probably owing

to the removal of corrosion product, but with larger [HNO₃] stirring does not affect passivation.

XII. The decomp. of aq. HNO₃ between passive Fe electrodes increases with applied p.d., and eventually H₂ is evolved at the cathode and reduction takes place. The p.d. at which reduction occurs rises with [HNO₃].

J. G. A. G.

Diffusion of cathodically produced hydrogen and deuterium through iron. P. C. BLOKKER (Rec. trav. chim., 1936, 55, 979—988).—The difference between the overpotential vals. for H₂ and D₂ at an Fe cathode in dil. H₂SO₄ containing As₂O₃ or HgCl₂ bears no relation to the difference in the diffusion velocities of the two gases in the cathode. E. S. H.

Electrochemical coating of metal surfaces with a monatomic film of nobler metal. O. ERBACHER (Z. physikal. Chem., 1936, 178, 15—28).—Previous investigations (A., 1933, 468) have been amplified. If a metal is brought in contact with a solution containing ions of a nobler metal and if the less noble metal is such as not to react with the solvent in absence of the nobler ions, then there is no exchange between the electrode and the solution, but only slight adsorption of the nobler ions. If deposited nobler metal redissolves in the liquid more rapidly than it is deposited, then exchange occurs and a monat. film of nobler metal is formed on the electrode.

R. C.

Effect of pretreatment of metal surfaces on electrochemical separation. O. ERBACHER (Z. physikal. Chem., 1936, 178, 43—56; cf. A., 1933, 468).—Mechanical pretreatment of Pb and Bi produces solubility local elements, and when either metal is brought into contact with a solution containing its ions, exchange occurs between the solution and a layer many atoms thick on the surface of the metal. Etching with HNO₃ may paralyse the most active local elements and exchange is then confined to a monat. layer. In certain circumstances treatment of Ni with emery-paper does not produce local elements and exchange between the Ni and a solution of Ni²⁺ or Bi³⁺ ions occurs only in a monat. layer. Polishing or etching renders Ni partly passive, and so gives rise to local elements, and a layer of Bi many atoms thick may be formed on its surface by exchange.

R. C.

Microcoulombmetry and unimolecular oxide films. Theory of adsorptional centres. I. R. KLJATSCHKO (J. Gen. Chem. Russ., 1936, 6, 1179—1192).—The tenacity with which films of oxide, phosphate, silicate, sulphate, sulphide, or chromate adhere to a Pb anode varies inversely with the val. of B_{12} (hysteretic wettability, determined from the angle of contact at the boundaries Pb-H₂O-air). Using very small currents (8—10 microamp.) the amount of O₂ adsorbed at a Pb surface \propto no. of adsorption centres Z' , and not to the no. of atoms or mols., Z ; $k = Z'/Z = 2·06$ for Ag and 0·63 for Pt. The vals. of k are const. only under rigorously fixed conditions, and are not practically reproducible. With increasing current k rises to a max. for given conditions. The val. of B_{12} of a Ag anode falls after formation of an oxide film, which may partly be removed by washing with org. solvents, the efficiency

of which varies in the order $C_6H_6 < C_2H_4Cl_2 < EtOH < CHCl_3 = CCl_4$.
R. T.

Electrode processes of deposition or dissolution of metals, in relation to the nature of the ions and the concentration. N. A. ISGARISCHEV and E. J. MAJEROVA (J. Gen. Chem. Russ., 1936, 6, 1208—1229).—The cathodic polarisation P in the electrolysis of Cd salts increases in the order $CdCl_2 = CdBr_2 < CdI_2 < Cd(OAc)_2 < Cd(NO_3)_2$, and does not appear to be connected with the equilibrium potential ε , p_H , sp. conductivity κ , or ionic activity A of the solutions. The same applies to solutions of $CdCl_2$ containing alkali or alkaline-earth ions, all of which reduce P ; their action increases in the series $Na < K < NH_4 = Ca = Ba < Sr < Mg$. Traces of As greatly increase P , whilst Cu and Sb have little action. Addition of Zn salts or gelatin raises or lowers the val. of P , according to the concn. The val. of P falls to a min., and then rises as the $[CdSO_4]$ is increased from 0.25 to 4N: ε , p_H , κ , and A do not vary parallel with P . At 25° P is $>$ at 50° for 0.25—1N. and lower for 2—4N- $CdSO_4$. In all the above cases, anodic polarisation is inconsiderable, and varies independently of the cathode process. In the case of Zn salts P diminishes in the series $ZnSO_4 > Zn(OAc)_2 > ZnCl_2 > ZnI_2$, and rises with increasing $[Zn^{++}]$.
R. T.

Protracted change with time of cathodic overvoltage on platinum. G. MASING and G. LAUE (Z. physikal. Chem., 1936, 178, 1—14).—The H overvoltage, in aq. KOH rises for some time after the circuit has been closed, but ultimately reaches a const. val., E . If the c.d., I , is kept const. $dE/d \log I = b = 0.109$. If the cathode potential, ε , is kept const. $b = 0.120$; Volmer's theory of overvoltage requires $b = 0.116$. Previous cathodic polarisation accelerates the rise of ω , whilst anodic polarisation has the opposite effect; in both cases the same val. of E is reached as when there is no previous polarisation. For Pt recryst. by heating to incandescence with a.c. ω changes more slowly, and the const. val. ultimately reached is smaller. It is inferred that Volmer's double-layer theory explains overvoltage even after protracted passage of current, and that the rise of ω with time is due to active points on the electrode gradually becoming inactive. The amount of H liberated from the electrode after the circuit is opened $\propto \varepsilon$. Part of the H appears to be in solid solution within the electrode.
R. C.

Dissociation constants in water and deuterium oxide. Measurements with the deuterium electrode. C. SCHWARZENBACH, A. EPPRECHT, and H. ERLÉNMEYER (Helv. Chim. Acta, 1936, 19, 1292—1304).—The normal potential of the D_2 electrode is -0.0022 volt. The calc. ionic product of 99.6% D_2O is $10^{-14.804}$ corresponding with $10^{-14.807}$ for 100% D_2O as compared with $10^{-14.073}$ for H_2O . The above results are discussed and the dissociation consts. of various compounds and ions in D_2O calc.
J. W. S.

Dissociation constants of reductive acid and of its product of oxidation by iodine. G. CARPENT (Compt. rend., 1936, 203, 1156—1158).—Vals. obtained at 20° using an electrometric titration method,

H^* (A., I.)

are: reductive acid, 1.9×10^{-5} ; oxyreductive acid, about 3.3×10^{-9} .
A. J. E. W.

Oxidation-reduction potential of thioindigotin-tetrasulphonate.—See A., II, 30.

Potentiometric study of flavins. L. MICHAELIS, M. P. SCHUBERT, and C. V. SMYTHE (J. Biol. Chem., 1936, 116, 587—607).—Normal potentials of several derivatives of isoalloxazine and flavin, including lactoflavin or vitamin- B_2 , have been determined. All the dyes on partial reduction form a semiquinone (I) which is red in very acid solution and green at p_H 2—12. The max. amount of (I) which can exist with the other forms of the dye through a wide p_H range is approx. 10%, and is practically const. The naturally occurring flavins increase the O_2 consumption of yeast extract only very slightly, but the alloxazine dyes are more active and are comparable with methylene-blue.
J. N. A.

Incorporation of thermodynamic variables in chemical kinetics. E. A. MOELWYN-HUGHES (Trans. Faraday Soc., 1936, 32, 1723—1738).—Methods of introducing thermodynamic variables into expressions for reaction velocity are discussed.
F. L. U.

Gas reactions in chemical kinetics. M. BODENSTEIN (Ber., 1937, 70, [A], 17—34).—A lecture.

Dissociation of hydrogen by tungsten. G. BRYCE (Proc. Camb. Phil. Soc., 1936, 32, 648—652).—The rate of production of at. H on heating a W filament in H_2 has been investigated by observing the pressure change, the at. H produced being absorbed in MoO_3 or WO_3 . With W at const. temp., the rate of dissociation \propto the square root of the pressure. An expression for the abs. rate of production of H atoms is given.
A. J. E. W.

Mechanism of the production of atomic hydrogen by hot tungsten. J. K. ROBERTS and G. BRYCE (Proc. Camb. Phil. Soc., 1936, 32, 653—656; cf. preceding abstract and A., 1936, 422).—Experimental data can be interpreted by assuming either of two possible mechanisms, viz., evaporation of adsorbed atoms from a sparsely-covered surface, or the splitting of an incident H_2 mol. to give two H atoms, one of which is adsorbed, and the other evaporated. In the latter case the surface is almost completely covered.
A. J. E. W.

Kinetics of OH radicals as determined by their absorption spectra. II. Electric discharge through hydrogen peroxide. A. A. FROST and O. OLDENBERG (J. Chem. Physics, 1936, 4, 781—784; cf. this vol., 34).—To study the kinetics of OH radicals in H_2O_2 the concn. of OH as a function of time was measured by the decay of the intensity of the OH absorption bands after interrupting an electric discharge through H_2O_2 . A fresh supply of H_2O_2 was used for each snapshot and was partly decomposed into OH by an electric discharge of short duration. OH radicals disappear more rapidly in Il_2O_2 than in H_2O , indicating a bimol. reaction $OH + H_2O_2$. The emission spectrum of OH shows abnormal rotation of OH when excited in $H_2O_2 >$ in H_2O , the rotation being determined by the simultaneous dissociation

and excitation producing the OH radicals and not by the temp. W. R. A.

Gaseous combustion. W. T. DAVID (Nature, 1936, 138, 930).—A discussion. L. S. T.

Soap-bubble method of studying the combustion of mixtures of CO and O₂. E. F. FROCK and C. H. ROEDER (Nat. Adv. Comm. Aeronaut. Rept., 1935, No. 532, 14 pp.).—Data for flame speeds in CO-O₂ mixtures of varied humidity are recorded.

CH. ABS. (e)

Law governing the initial acceleration of slow combustion and the retardation of inflammation of mixtures of pentane, oxygen, and nitrogen. M. PRETTE (Compt. rend., 1936, 203, 1152—1154).—The pressure increase of mixtures at 260—300° is given by: $\Delta p = ke^{\phi t}$; the const. ϕ varies according to the relation $\phi = \phi_0(1 + \alpha P_n)$, where P_n —partial pressure of N₂, $\alpha = \text{const.}$, and $\phi = \phi_0$ when $P_n = 0$. Also $\tau(1 + \alpha P_n) = \text{const.}$, where τ = time after which inflammation occurs. A. J. E. W.

Kinetics of oxidation and ignition of hydrocarbons. I. Ignition delay and slow pre-oxidation of mixtures of *n*-pentane and oxygen between 250° and 300°. Laws governing explosion phenomena. M. PRETTE (Ann. Off. nat. Comb. liq., 1936, 11, 669—718).—The spontaneous ignition of C₅H₁₂-O₂ mixtures, containing $\geq 20\%$ of C₅H₁₂, under an initial pressure of 100—760 mm. was studied by the static method from 240° to 300°. Ignition delay, τ , varied between 1 and 300 sec., and at const. temp. could be expressed by $-P_c P_t = \text{const.}$, where P_c and P_t are the partial pressure of the fuel and total pressure, respectively. The pressure variation, Δp , caused by slow oxidation corresponded with $\Delta p = ke^{\phi t}$, where $\phi = k_1 P_c P_t^2$, confirming the relation, $\phi\tau = \text{const.}$ These results, predicted from the theory of chain reactions, are discussed in relation to the phenomenon of knocking in internal-combustion engines. R. B. C.

Mechanism of thermal change in gaseous organic compounds. M. W. TRAVERS (Nature, 1936, 138, 967—968).—The main process is assumed to be mols. \rightarrow activated state \rightarrow complex \rightarrow unstable intermediate \rightarrow paired products and the rate of reaction generally measured is the transformation complex \rightarrow unstable intermediate. Free radicals are not accountable for the processes involved. Thermal decomp. of C₂H₆ and of C₂H₆-C₂H₄-H₂ equilibrium mixtures etc. are discussed. L. S. T.

Rate of thermal decomposition of ammonia on a quartz surface. J. A. CHRISTIANSEN and E. KNUTH (Kong. dansk Viden. Selsk., nat.-fys. Medd., 1935, 13, No. 12, 18 pp.; Chem. Zentr., 1936, i, 1172).—Experiments at 789—884°/2—7 cm. confirmed Hinshelwood and Burk's results (A., 1925, ii, 691). The rate depends on the pretreatment of the walls. The mechanism involves the intermediate formation of NH. On adding H₂O vapour to the reaction product and cooling in liquid air, NH₂OH and HNO₂ were detected in the condensate (NH + H₂O = NH₂OH). H. J. E.

Atomic chlorine. G. M. SCHWAB [with H. FRIESS] (Z. physikal. Chem., 1936, 178, 123—137; cf. A.,

1933, 1021).—O₂, CCl₄, COCl₂, and HCl have no effect on at. Cl. CO₂ activates the recombination of the Cl atoms on quartz. C₂H₄ apparently forms with a current of active Cl an explosive substance. The fact that the collision yield for the recombination of Cl atoms on the wall is ≈ 1 is usually due to the Cl atoms or atoms of the wall requiring a small energy of activation (~ 1 kg.-cal. on quartz) to enter into reaction, but is sometimes due to the inertness of parts of the wall. Ag brings about recombination of Cl atoms rather more rapidly than Mg, but its activity may be considerably affected by the formation of AgCl on its surface. R. C.

Thermal decomposition of F₂O₂. P. FRISCH and H. J. SCHUMACHER (Z. physikal. Chem., 1936, B, 34, 322).—Between -25° and -60° the decomp. is homogeneous, may be represented by $10^{12.4} \times 10^{-17.000/4.577} [F_2O_2]$, and yields an equimol. mixture of F₂ and O₂, not FO (cf. A., 1934, 378). R. C.

Effect of helium on the kinetics of the thermal decomposition of acetaldehyde. C. J. M. FLETCHER (J. Amer. Chem. Soc., 1936, 58, 2646—2647).—The presence of He increases the rate of reaction in a way which suggests that the decomp. does not follow a chain mechanism, but involves the direct rearrangement: MeCHO \rightarrow CH₄ + CO. E. S. H.

Thermal decomposition of crotonaldehyde.—See A., II, 50.

Highly polymerised compounds. CXLVI. Kinetics of chain polymerisation. I. Thermal polymerisation of pure styrene. G. V. SCHULZ and E. HUSEMANN (Z. physikal. Chem., 1936, B, 34, 187—213).—The rate of polymerisation as a whole is determined by that of the primary reaction (activation of the monomeric styrene mol.), which follows the unimol. law, and has a heat of activation of 23,200 g.-cal. and a const. of action of $10^{5.35} \text{ sec.}^{-1}$. The distribution of mol. wts. in the product shows that the mean chain length of the resultant mols. is determined by the ratio of the velocities of the chain-breaking reaction (i) and the chain-growth reaction (ii) (cf. A., 1936, 295). Since the mean mol. wt. remains approx. const. during the reaction, (i) as well as (ii) must be bimol. It is probable that chain-breaking consists in the migration of a H from one growing mol. to another, whereby the free terminal valencies become saturated (cf. A., 1935, 740). This view explains the diminution in chain length caused by catalysts and the effect of temp. on the chain length. The velocity of (ii) is $< 10^{10}$ times that of the primary reaction. R. C.

Kinetics of thermal *cis-trans* isomerisation. VI. G. B. KISTIAKOWSKY and W. R. SMITH (J. Amer. Chem. Soc., 1936, 58, 2428—2430; cf. A., 1936, 452).—The isomerisation of β -cyanostyrene is a first-order reaction; the velocity coeff. at higher pressures is given by $k = 10^{11.6 \pm 0.4} e^{-(46,000 \pm 1000)/RT} \text{ sec.}^{-1}$. The equilibrium mixture at 352° contains 63% of the *trans*-isomeride. The equilibrium composition is practically independent of temp. E. S. H.

Steric hindrance. W. HÜCKEL (Z. physikal. Chem., 1936, 178, 113—122).—Theoretical. Applic-

ation of Arrhenius' equation to the temp. coeffs. of numerous reactions exhibiting steric hindrance gives a high val. of both the activation energy, q , and the const. of action, α . Hinshelwood's theory of steric hindrance (A., 1935, 828) affords no adequate explanation. A possible explanation is that $\alpha \propto$ temp. It may be supposed that before reaction can occur the reacting mols. must assume a favourable orientation, requiring a certain amount of energy. If orientation is an endothermic process α will rise with temp., and *vice versa*. If the steric hindrance is due to a protective group having to be forced aside, with a certain expenditure of energy, this is equiv. to orientation, and both α and q will be large. If, on the other hand, steric hindrance arises from access to the reactive group being largely obstructed by another group α will be small and q large. The variation of α with temp. to be expected on this theory is in harmony with the experimental data for temp. coeffs. It is concluded that whilst α always involves a purely steric factor it may contain energy factors also.

R. C.

Periodic reactions. F. M. SCHEMJAKIN (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 63—64).—The periodicity const. of periodic reactions increases with decrease in concn. of the exterior and interior components and of the medium, approaching $\lambda v = hN/M$ (λ = distance between layers, v = velocity of expansion of field of diffusion, M = mol. wt. of the exterior electrolyte, h = Planck's const., N = Avogadro no.). The max. val. is much $>$ that calc. theoretically by Christiansen and Wulff (A., 1934, 955). O. D. S.

Reactivity of hydrogen peroxide in bromine-bromide solutions. R. O. GRIFFITH and A. McKEOWN (J. Amer. Chem. Soc., 1936, 58, 2555—2558).—Observations contrary to those of Bray and Livingston (A., 1923, ii, 473) are reported. E. S. H.

Exchange reactions of heavy water with organic compounds. I. Phenol, acetanilide, and the formate ion. P. A. SMALL and J. H. WOLFENDEN (J.C.S., 1936, 1811—1817).—The H of the OH group of PhOH and of the NH of NHAcPh exchanges rapidly with the D of D₂O; the distribution of D between H₂O and org. compound favours the latter. PhOH undergoes nuclear exchange catalysed by alkali on prolonged heating with D₂O, but *s*-C₆H₄Cl·OK shows no exchange under similar conditions. The exchange of D₂O with Na and K formates is very slow, which is inconsistent with a structure proposed for HCO₂' (A., 1936, 663). J. G. A. G.

Ratio between the hydrogen-ion concentration and the velocity of decomposition of ethyl diazoacetate in organic media. M. DUBOUX and R. FAVRE (Helv. Chim. Acta, 1936, 19, 1177—1190).—The velocity coeff. of the decomp. of CHN₂·CO₂Et in presence of dil. org. acids with or without their Na salts is not exactly \propto [H⁺] deduced from conductivity measurements, but is relatively the lower the lower is the acid concn., especially in presence of the Na salt. Figures are given for the proportionality factor for acid concns. between 0.1*N* and 0.0005*N*, and these permit the use of Bredig and Fraenkel's method of determining the [H⁺]. J. W. S.

Influence of solvent on the course of chemical reactions. IX. Kinetics of simple substitution reactions. K. LAUER X. Kinetics of the reaction between allyl bromide and sodium phenoxide in dissociating solvents. K. LAUER and H. SHINGU (Ber., 1936, 69, [B], 2618—2626, 2731—2742).—IX. Measurements of the rate of halogenation of aromatic compounds in solution, of nitration of anthraquinone (I) and PhNO₂ in H₂SO₄, and of sulphonation of (I) and benzanthrone show that in general simple substitution reactions do not occur with the velocity expected from the collision theory. The latter is not regarded as disproved since it is satisfactory in many cases and there are sufficient reasons for its breakdown with solutions. A possible relationship between dielectric capacity or conductivity of the solvent and deviations from the expected rates of reaction is indicated.

X. The rate of reaction of C₃H₅Br with NaOPh giving 98—99% of PhO·C₃H₅ and 2—1% of *o*-C₃H₅·C₆H₄·OH has been followed kinetically at various temp. in abs. EtOH, MeOH, COMe₂, EtOH·COMe₂, and EtOH·H₂O. It is probable that allylation and other alkylations of alkoxides and phenoxides does not take place through the free ions or mols., but that associates and solvates are present in the solutions and that their composition is greatly altered by dilution. The heterogeneous media are regarded as solutions of electrolytes of medium strength in which the change occurs exclusively with the OPh ion. Change in the rate of reaction with dilution is attributed to the influence of the solvent on the condition of the latter; the more rapid change in COMe₂ than in EtOH is thereby explained. Allylation in alcoholic media occurs approx. in accordance with the collision theory, whereas it is considerably slower in COMe₂, H₂O, COMe₂·EtOH, and H₂O·EtOH. H. W.

Temperature dependence of the energy of activation in the rearrangement of *N*-chloroacetanilide. J. O. PERCIVAL and V. K. LA MER (J. Amer. Chem. Soc., 1936, 58, 2413—2418).—The rate of conversion in presence of 0.2*M*-HCl has been determined at 0°, 12.5°, 25°, and 37.5°. The energy of activation rises steadily from 19,170 g.-cal. at 0—12.5° to 20,750 g.-cal. at 25—37.5°, corresponding with a mean heat capacity of activation of 63 g.-cal. per degree. The action const. *B* varies from 13.2 at 6.33° to 14.45 at 31.3°. Evidence of the inadequacy of the collision theory and of the existence of an appreciable entropy of activation is given. E. S. H.

Rearrangement of *N*-chloroacetanilide in presence of radioactive hydrochloric acid. A. R. OLSON, C. W. PORTER, F. A. LONG, and R. S. HALFORD (J. Amer. Chem. Soc., 1936, 58, 2467—2472).—A kinetic study shows that the rearrangement does not proceed exclusively either by an intramol. rearrangement or by a Cl intermediate, but probably by a combination of these mechanisms. E. S. H.

Rates of alcoholysis of acyl chlorides. G. E. K. BRANCH and A. C. NIXON (J. Amer. Chem. Soc., 1936, 58, 2499—2504).—The rates of alcoholysis of Ac, tri-, di-, and mono-chloroacetyl, *p*-nitro-, -fluoro-,

-bromo-, -iodo-, -methyl-, and -methoxy-benzoyl chlorides in $\text{Et}_2\text{O}-\text{EtOH}$ (60:40) have been determined in very dil. solutions at 25° . The kinetics of reaction and the influence of substituent groups on reactivity are discussed. E. S. H.

Mechanism of formation of ionic compounds of higher order (double salts, spinels, and silicates). C. WAGNER (Z. physikal. Chem., 1936, B, 34, 309—316).—In the formation of the above compounds by reaction between solid salts and salt-like compounds diffusion processes play the chief part. Assuming that in diffusion it is those ions which are responsible for electrolytic conduction which play the determining part, a formula is derived for the reaction velocity in terms of the work of formation of the reaction, A , the conductivity, and the transport nos. of the ions, or of A and the self-diffusion coeffs. of the ions. Examples of various types of reaction mechanism are discussed. R. C.

Formation of Ag_2HgI_4 by reaction between solid mercuric and silver iodides. E. KOCH and C. WAGNER (Z. physikal. Chem., 1936, B, 34, 317—321).—Reaction occurs principally by diffusion of Ag^+ and Hg^{2+} ions and the velocity agrees with the equation previously deduced (cf. preceding abstract). R. C.

Mechanism of diffusion through protective oxides and influence of pressure on the rate of oxidation of nickel. G. VALENSI (Compt. rend., 1936, 203, 1154—1156).—Mainly theoretical. Experimental data for the oxidation of Ni are given. A. J. E. W.

Kinetics of oxidation of metals forming two oxides. G. VALENSI (Compt. rend., 1936, 203, 1252—1254; cf. preceding abstract).—A theoretical discussion of the mechanism of oxidation of metals which form surface layers composed of two different oxide films. The two oxides are formed in const. proportions at const. O_2 pressure. The wt. of O_2 absorbed $\propto \sqrt{\text{time}}$ at const. temp. A. J. E. W.

Laminar systems. IV. Kinetics of the formation of cupric hydroxide layers at the surface of cuprammonium solutions. S. G. MOKRUSCHIN and P. S. KONJAEV (Kolloid-Z., 1936, 77, 301—305; cf. A., 1935, 1317).—The thickness of the film increases linearly with time. The interference colours produced are discussed. The film is permeable to NH_3 . E. S. H.

Dissolution of vacuum films of metals in acids. II. Dissolution of iron and nickel in sulphuric acid. M. A. ROSENBERG and K. E. AVAILIANI (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 179—180; cf. this vol., 41).—The films of Fe, whether previously exposed to air or not, dissolved rapidly in 2*N*-, 0.5*N*-, and 0.01*N*- H_2SO_4 , but relatively slowly in 0.001*N*, where rusting occurred simultaneously. Brownish-grey films of Ni, 12—100 μ thick, dissolved very slowly in 2*N*- and 0.5*N*- H_2SO_4 , and not at all in 0.1*N*. R. C. M.

Velocity of dissolution of comminuted substances. II. W. JACEK (Rocz. Chem., 1936, 16, 339—347; cf. A., 1929, 391).—An expression for the velocity of dissolution of solid particles of any shape

or size is derived, and shown to hold for the case of NaCl in H_2O . R. T.

Application of affinity and quantum statistics to catalysis. (MLLE.) G. SCHOULS (Bull. Acad. roy. Belg., 1936, [v], 22, 1064—1071).—At 273° and 773° abs., the difference in the reaction affinity of O_2 in the $^1\Sigma^+$ (activated) and $^3\Sigma^-$ electronic levels is $\approx +36$ kg.-cal. R. C. M.

Influence of added catalysts on the catalytic decomposition of hydrogen peroxide in presence of dichromate. M. BORTELSKY and L. BORTELSKY-CHAJKIN (Compt. rend., 1936, 203, 1158—1160).—The decomp. is pseudo-unimol. in absence of catalysts. 3*N*- NH_4Cl and $-(\text{NH}_4)_2\text{SO}_4$ scarcely affect the reaction. The catalytic effects of the following ions are in the order of magnitude given: $\text{Mn}^{2+} > \text{Cu}^{2+} > \text{Fe}^{3+} > \text{Co}^{2+} > \text{Ni}^{2+}$. The rate of decomp. for low concns. (c) $\propto \log c$. The temp. coeff. is unaffected by catalysts. A. J. E. W.

Acid catalysis in light and heavy water. O. REITZ (Naturwiss., 1936, 24, 814).—Reactions catalysed by H^+ proceed more rapidly in D_2O than in H_2O , whereas those which are catalysed by proton donors generally proceed more slowly in D_2O than in H_2O . A simple connexion between the type of reaction and the effect of D_2O cannot, however, be derived, since the bromination of COMe_2 , which shows general acid catalysis, proceeds more rapidly in the presence of D^+ than H^+ , k_p/k_H being 1.8 at 25° . A. J. M.

Acid catalysis in non-aqueous solvents. IV. Depolymerisation of paraldehyde. R. P. BELL, O. M. LIDWELL, and M. W. VAUGHAN-JACKSON (J.C.S., 1936, 1792—1799).—The kinetics of the depolymerisation of paraldehyde (I) in C_6H_6 , PhNO_2 , amyl acetate, and anisole, catalysed by HCl and mono-, di-, and tri-chloroacetic acids, have been investigated dilatometrically and analytically at 0— 146° . The reaction is unimol. with respect to (I) and has an apparent order varying between 1.5 and 2.5 with respect to acid. A composite reaction mechanism involving the three O atoms of the (I) mol. is suggested. The catalytic power of the acids is in the same order as the acid strengths, but varies more than the dissociation consts. in H_2O . The reaction velocity is greatly affected by the solvent, partly owing to varying association of the carboxylic acids and to combination between the acids and solvents. H_2O is a strong inhibitor. J. G. A. G.

Mechanism of the bromination of aliphatic $\alpha\alpha$ -disulphones in aqueous acid solutions. L. RAMBERG and E. SAMÉN (Arkiv Kemi, Min., Geol., 1936, 12, A, No. 8, 10 pp.).—Thirty possible mechanisms are discussed, involving the interaction of disulphone (I) or its anion with Br_2 , Br_3^+ , HOBr , OBr^+ or Br^+ , catalysed by H^+ or OH^+ , or reacting spontaneously. It is considered that of these only two are probable, viz., interaction between (I) and Br_2 catalysed by OH^+ , or a spontaneous reaction between the anion of (I) and Br_2 . C. R. H.

Kinetics of the bromination of aliphatic $\alpha\alpha$ -disulphones in aqueous solutions of hydrobromic acid. E. SAMÉN (Arkiv Kemi, Min., Geol., 1936, 12, A, No. 7, 10 pp.).—Previous work (cf. A., 1934,

1313) has been extended to the determination of the influence of KBr, NaBr, KClO_4 , NaClO_4 , and K_2SO_4 on the val. for k . For $[\text{HBr}] < 0.1N$ and for const. $[\text{Br}^-]$, k approx. $\propto 1/[\text{H}^+]$, assuming $[\text{H}^+] = [\text{HBr}]$, except in the presence of K_2SO_4 . The increased val. for k here observed is due to a reduction in $[\text{H}^+]$ and the formation of HSO_4^- . The salt effect of perchlorates and the effect of interchanging K with Na are negligible. C. R. H.

Catalysis of ionic oxidation-reduction reactions by dyes and its probable mechanism. P. A. SHAFFER (J. Physical Chem., 1936, 40, 1021—1026; cf. A., 1933, 678).—Naphthaquinones, anthraquinones, indigotin, pyocyanine, flavin, and rosinduline are all markedly catalytic in the $\text{Ti}^{+++} + \text{I}_3^-$ reaction, and they also show evidence, on reduction, of an intermediate semiquinone stage. Their ability to catalyse ionic oxidation-reduction reactions in which the reactants accept and donate unequal nos. of electrons (i.e., 1 and 2, respectively) is attributed to the above property. F. L. U.

Heats of activation in the mutarotation of glucose. I. Catalysis in sodium hydroxide solutions. G. F. SMITH (J.C.S., 1936, 1824—1828). The rate of mutarotation of glucose in very dil. CO_2 -free solutions of NaOH has been determined at 0° , 5° , 10° , and 15° . The glucosate ion (I), in addition to OH^- , is an active catalyst, and in the solutions investigated accounts for 18—41% of the observed velocities. Catalytic coeffs. have been evaluated, and at 15° are 26.3 and 5100 for (I) and OH^- , respectively. The heats of activation are 17,000 and (probably) 17,700 g.-cal. for catalysis by (I) and OH^- , respectively. The bearing of the results on Euler's theory of acid and base catalysis is discussed. J. G. A. G.

Metal ion activation in enzymic catalysis. Arginase. L. HELLERMAN and C. C. STOCK (J. Amer. Chem. Soc., 1936, 58, 2654—2655).—The influence of Mn^{2+} , Co^{2+} , Ni^{2+} , and Fe^{2+} on the arginase-arginine reaction in buffered solutions of different p_H has been studied and compared with the stabilities of corresponding co-ordination complexes of these ions. E. S. H.

Catalysis with fine foam and colloidal metals. III. Comparison of catalytic action of palladium, platinum, and rhodium. G. KAHL and E. BIESALSKI (Z. anorg. Chem., 1936, 230, 88—94; cf. A., 1930, 1133).—In hydrogenation by colloidal metals involving the activation of H_2 only, as with O_2 or C_2H_4 , the order of decreasing activity is $\text{Pd} > \text{Pt} > \text{Rh}$, whereas in the reduction of aq. NaClO_3 it is $\text{Pt} > \text{Rh} > \text{Pd}$, and with KNO_3 $\text{Rh} > \text{Pt} > \text{Pd}$. Comparison of the foam method with the methods of Skita and of Paal shows that, in the hydrogenation of cinnamic acid, Skita's process is more rapid but less convenient, whilst Paal's is much slower than either of the others. F. L. U.

Dependence of catalytic activity on the amount of promoter. O. BLOCH and N. I. KOBOSOV (Acta Physicochim. U.R.S.S., 1936, 5, 417—432).—The decomp. at 30° of H_2O_2 catalysed by mixtures of Fe_3O_4 and Al_2O_3 has been studied. With increase of

Al_2O_3 up to approx. 2 wt.-% the catalytic activity increases, but further addition of Al_2O_3 reduces the activity. The Al_2O_3 owes its promoting action to the formation of $\text{Fe}_3\text{O}_4 \cdot \text{Al}_2\text{O}_3$ at the surface of the catalyst, the activity of the complex being 3.7 times that of Fe_3O_4 . C. R. H.

Amorphous and crystallised hydrated oxides and oxides. XXIX. Catalytic decomposition of hydrogen peroxide and the "active positions" of the intermediate conditions occurring during the dehydration of natural and artificial ferric hydroxides. Crystallisation of $\alpha\text{-Fe}_2\text{O}_3$. A. KRAUSE [with H. KRACH] (Ber., 1936, 69, [B], 2708—2719).—The active conditions or active oxides formed by thermal decomp. of Fe^{III} hydroxides have catalytic activity and decompose H_2O_2 . The dehydration products of the röntgenographically amorphous, dark brown orthoferric hydroxide (I) decompose $0.2N\text{-H}_2\text{O}_2$ relatively easily, although less powerfully than (I). $\alpha\text{-Fe}_2\text{O}_3$, obtained by ignition at 800° , is almost inactive. Dehydration of (I), which when air-dried contains $> 3\text{H}_2\text{O}$ per Fe_2O_3 , is a continuous process during which H_2O present as such (about 2 mols.) is lost; the products [associates of (I)] are relatively readily sol. in acid and show only weak interferences of $\alpha\text{-Fe}_2\text{O}_3$. Finally dehydration involves the OH groups so that active H disappears very late in the process and the dehydrated oxide mols. (nuclei) are formed at a temp. at which the rate of growth of $\alpha\text{-Fe}_2\text{O}_3$ is great. A coarsely cryst., violet $\alpha\text{-Fe}_2\text{O}_3$ therefore results which is very dense and very sparingly sol. in acids. α -Oxides, obtained by heating the moist gel of (I) under H_2O , accelerate the decomp. of H_2O_2 slightly although they appear to have a low d and dissolve readily in boiling $1.4N\text{-H}_2\text{SO}_4$. Artificial, air-dried goethite does not decompose $0.2N\text{-H}_2\text{O}_2$ at 20° since it, as hydrate ($\alpha\text{-Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$), does not contain active H. It becomes catalytically active without suffering decomp. when gently heated at 150° . The oxides obtained by dehydration are more active and the resulting reaction is of the first order. The dehydration, goethite $\rightarrow \alpha\text{-Fe}_2\text{O}_3$, is discontinuous since oxide nuclei are formed irregularly owing to breakdown of the goethite mol. or lattice, thus causing the material to appear röntgenographically amorphous. The oxides have a low apparent d and are freely sol. in boiling $1.4N\text{-H}_2\text{SO}_4$. The red-brown $\alpha\text{-Fe}_2\text{O}_3$ formed at 800° in consequence of the rapid formation of nuclei and poor recrystallisation is moderately finely-divided and catalytically active but otherwise gives the normal Röntgen diagram of $\alpha\text{-Fe}_2\text{O}_3$. Catalytic activity appears generally parallel with fineness of division but the relationship is not universal. Dehydration of the very dense natural goethite occurs similarly apart from quant. differences, being discontinuous and giving catalytically active oxide modifications. Recryst. $\alpha\text{-Fe}_2\text{O}_3$ is formed at 800° . Catalytic activity of the active conditions through which goethite passes when dehydrated is caused by active spots which originate during the shattering of the lattice or mol. and are due to increase in the distances between Fe and O atoms. The changes are frequently so subtle that they cannot be detected röntgenographically. H. W.

Study of enzyme action by thermal analysis of reaction velocity. II. Action of inorganic ferment. E. SUTO (Proc. Imp. Acad. Tokyo, 1936, 12, 229—232; cf. A., 1935, 1278).—The catalytic decomp. of aq. H_2O_2 by colloidal Pt takes place in two stages. The duration of the initial process is short, independent of $[\text{H}_2\text{O}_2]$, but decreases with increasing concn. of colloidal Pt. The second process is the chief reaction, and is unimol. The velocity coeff. $\propto [\text{colloidal Pt}]^2$, approx. The initial stage is of variable order, and is attributed to adsorption processes. The catalytic activity of the colloidal Pt with respect to time passes through a max. J. G. A. G.

Andrussov's theory of the catalytic preparation of hydrocyanic acid. I. E. ADADUROV (Ukrain. Chem. J., 1936, 11, 237—249).—The reaction scheme proposed by Andrussov (A., 1935, 1329) for the prep. of HCN by passing $\text{CH}_4\text{--NH}_3$ -air through Pt gauze is improbable. The following is proposed: $\text{NH}_3 \rightarrow \text{N} + \text{H} + \text{H}_2$; $\text{CH}_4 \rightarrow \text{C} + 2\text{H} + \text{H}_2$; $\text{C} + \text{N} \rightarrow \text{CN}$; $\text{CN} + \text{H} \rightarrow \text{HCN}$; $\text{CN} + \text{H}_2 \rightarrow \text{HCN} + \text{H}$; $\text{H} + \text{O}_2 \rightarrow \text{OH} + \text{O}$; $\text{H}_2 + \text{OH} \rightarrow \text{H}_2\text{O} + \text{H}$. R. T.

Thermomagnetic study of iron catalysts used in the synthesis of hydrocarbons by the Fischer process. H. LEFEBVRE and G. LE CLERC (Compt. rend., 1936, 203, 1378—1380).—The thermomagnetic behaviour of a pure Fe oxide catalyst used in treating a CO--H_2 mixture is the same as that of Fe_3O_4 . When promoted with 0.1—1.0% of K_2CO_3 , and after a period of use, it shows a Curie point at 575° , due to Fe_3O_4 , and a second at 250° , due to a solid solution of K ferrite in cubic Fe_2O_3 . H. J. E.

Molecular orientation and catalysis. Dehydrogenation of cyclohexane catalysed by chromic oxide. A. A. BALANDIN and J. J. BRUSSOV (Z. physikal. Chem., 1936, B, 34, 96—120).—It is deduced from the multiplet theory of catalysis (A., 1929, 519) that there are two kinds of catalysed dehydrogenation. In one the reactant mol. lies flat on the catalyst surface, and for the dehydrogenation of a six-membered ring such as cyclohexane (I) in this way the catalyst must be a cryst. metal with a face-centred cubic or hexagonal lattice, e.g., Pt or Ni. This kind of reaction occurs at $\sim 300^\circ$. In the second type, the reactant mol. is held by two atoms of the catalyst, which need not have any particular kind of lattice or even be cryst. Reaction occurs at $\sim 450^\circ$ and metal oxides serve as catalysts. Rings other than those with six members will react, and unsaturated intermediate products are formed. As an example of this kind of catalysed reaction the dehydrogenation of (I) to C_6H_6 at $330\text{--}450^\circ$ on microcryst. Cr_2O_3 has been studied (cf. A., 1932, 1095). Langmuir's equation for the velocity of heterogeneous catalysed reactions is valid and at 400° the duration of sojourn of (I) mols. on the catalyst is approx. 2.5 times that of C_6H_6 mols. cyclo-Hexene and -hexadiene are formed as intermediate products. A sample of benzene from which mols. with six-membered rings had been removed underwent dehydrogenation on Cr_2O_3 , but not on Pt. MoO_3 acts as a dehydrogenating catalyst, but is less active than Cr_2O_3 . Replacement of a C of a ring by N or S causes the mol. to undergo dehydrogenation more readily. R. C.

Electrostatic phenomena in the catalytic oxidation of ethyl alcohol. A. S. COCOSINSCHI (Z. Elektrochem., 1936, 42, 876—879).—The production of ions in the catalytic oxidation of EtOH by air in presence of Pt has been confirmed. The effect is not due to thermionic emission. The mechanism is discussed. E. S. H.

Selective properties of (A) platinum, (B) palladium, in the hydrogenation of mixtures of unsaturated compounds. I. F. BOGDANOV and E. I. BASCHKIROVA (Bull. Acad. Sci. U.R.S.S., 1936, 91—103, 109—121).—(A) Hydrogenation of the components of mixtures of cinnamic acid (I) and oleic acid (II) (in EtOH) proceeds simultaneously in presence of Pt catalyst, at $10\text{--}20^\circ$. Hydrogenation of the second constituent of the pairs $\text{CH}_3\text{CH=CH}_2\text{OH}$ (III)–(I) or –(II) does not commence until that of (III) is complete.

(B) Pd catalyst behaves similarly to Pt with respect to hydrogenation of (III)–(II) mixtures. Hydrogenation of (I) in its mixtures with (III) does not commence until 80% of the latter has been saturated, whilst in mixtures of (I) and (II) hydrogenation of (II) commences only after practically complete hydrogenation of (I). R. T.

Raney's nickel [catalyst]. R. PAUL and G. HILLY (Bull. Soc. chim., 1936, [v], 3, 2330—2332; cf. A., 1935, 844).—Details are given for the prep. of an active Ni catalyst by a modification of Raney's technique. F. L. U.

Anodic formation of manganese dioxide. I. M. GELOSO and (Mlle.) C. ROULLARD. II. Different modes of oxidation. M. GELOSO (Bull. Soc. chim., 1936, [v], 3, 2221—2230, 2231—2236).—I. In the electrolysis of aq. MnSO_4 the current-anode potential curves consist of two ascending parts joined by a relatively flat portion representing a potential change which may reach 0.6 volt. Deposition of oxides of Mn occurs under conditions corresponding with the first, and evolution of O_2 with the second, of these branches. The influence of $[\text{Mn}^{++}]$, acidity, temp., and stirring on the form of the curves has been studied. The composition of the anodic deposit is $\text{MnO}_2 \cdot x\text{MnO}$, x being always $< 1 > 0$. The proportion of MnO_2 increases with decrease of $[\text{Mn}^{++}]$ and of p_{H} , the max. observed being 96.5%.

II. The formation of MnO_2 is due to two mechanisms, viz., (1) (a) $\text{Mn}^{++} \rightarrow \text{Mn}^{++++} + 2e$, (b) $\text{Mn}^{++++} + 2\text{H}_2\text{O} \rightarrow \text{MnO}_2 + 4\text{H}^+$, and (2) $\text{MnSO}_4 + \frac{1}{2}\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + \text{MnO}_2$. F. L. U.

Electrolytic separation of lanthanum and thorium from organic solutions. I. A. ATANASIU and M. BABOR (Bul. Chim. Soc. Romane, 1935—1936, 38, 83—90).—The separation has been studied in org. solutions free from H_2O , and from 97% EtOH and MeOH. In the latter case the influence of reducing agents and of the metal composing the cathode has been investigated. D. C. J.

Electrochemical preparation of nitric esters.—See A., II, 45.

Nature of electrode reactions. I. Factors affecting the electrochemical reduction of

N-nitrosomethylaniline. J. E. WELLS, D. E. BABCOCK, and W. G. FRANOE (J. Amer. Chem. Soc., 1936, 58, 2630—2632).—The influence of temp., c.d., acid concn., and electrode material has been investigated. The reaction provides a satisfactory method of prep. of $\text{NPhMe}\cdot\text{NH}_2$; the yield is 85%.

E. S. H.

Chemical reaction in electric discharges. II. Chemical activity of ions. R. W. LUNT (Trans. Faraday Soc., 1936, 32, 1691—1700; cf. A., 1936, 567).—Theoretical. There are many reasons for believing that chemical reaction in discharges is generally unlikely to be attributable to ions.

F. L. U.

Mechanism of chemical reaction in the electric discharge. E. J. B. WILLEY (Nature, 1936, 138, 1054—1055).—Theories that positive ions are the reacting bodies, clusters being formed, are unsatisfactory, but the hypothesis that the positive ions are forerunners of the true reactive species explains many observed facts.

L. S. T.

Oxidation of selenium in the glow discharge. II. Study of variables and characterisation of product. III. Striated deposits and possible mechanism. E. OLSON and V. W. MELOCHE (J. Amer. Chem. Soc., 1936, 58, 2511—2514, 2514—2516; cf. A., 1934, 739).—II. The best conditions of pressure, current, electrode distance, and shape of tubes for the production of SeO_2 and SeO_3 have been determined. The reaction is best initiated in the negative glow.

III. Correlation of voltage measurements with the banded deposits of Se and SeO_2 shows that vaporisation and activation of Se takes place in the luminous regions of the discharge, and combination with O_2 occurs in the dark regions. A mechanism is put forward.

E. S. H.

Photo-decomposition of ammonia. H. J. WELGE and A. O. BECKMAN (J. Amer. Chem. Soc., 1936, 58, 2462—2467).—With small amounts of decomp. the quantum yield approaches 1 and the gaseous products approach pure H_2 for the photochemical decomp. For the Hg-photo-sensitised decomp. the quantum yield is 0.12.

E. S. H.

Photochemical oxidation of ammonia in seawater. N. W. RAKESTRAW and A. HOLLAENDER (Science, 1936, 84, 442—443; cf. A., 1933, 236).—Data for the photochemical oxidation of NH_3 to NO_2^- in sea- H_2O are recorded. Oxidation does not occur in distilled H_2O . Ultra-violet light also slowly destroys nitrite in sea- H_2O .

L. S. T.

Mechanism of the photochemical decomposition of methane. W. GROTH and H. LAUDENKLOS (Naturwiss., 1936, 24, 796).—The photochemical decomp. of CH_4 has been investigated using an improved Harteck Xe lamp giving ultra-violet light of high intensity. The decomp. products are H_2 and hydrocarbons, chiefly C_2H_2 with some C_2H_6 and traces of C_2H_4 and hydrocarbons with 3—5 C. 1.30 ± 0.05 H_2 were produced per quantum absorbed. It is considered that the following reactions occur: $\text{CH}_4 = \text{CH}_3 + \text{H}$; $\text{CH}_3 + \text{H} = \text{CH}_2 + \text{H}_2$; $2\text{CH}_2 = \text{C}_2\text{H}_2 + \text{H}_2$. This would give 0.5 C_2H_2 and 1.5 H_2 per quantum.

A. J. M.

Photochemical formation of carbonyl chloride from chloroform, chlorine, and oxygen sensitised by chlorine, and retardation by alcohols and ammonia. H. J. SCHUMACHER and D. SUNDHOFF (Z. physikal. Chem., 1936, B, 34, 300—308).—Reaction occurs according to $d[\text{COCl}_2]/dt = kI_{\text{abs.}}[\text{CHCl}_3]^{\frac{1}{2}}$. Formation of COCl_2 can be almost completely suppressed by added MeOH, EtOH, or NH_3 owing to these substances reacting with Cl atoms propagating the reaction chains.

R. C.

Bromination of acetylene in light. W. FRANKE and H. J. SCHUMACHER (Z. physikal. Chem., 1936, B, 34, 181—186; cf. A., 1936, 1228).—Repetition of Boohar and Rollefson's experiments (A., 1935, 48) with an improved apparatus has not confirmed their results. The photochemical union of C_2H_2 and Br_2 to give $\text{C}_2\text{H}_2\text{Br}_2$, which is a chain reaction with a quantum yield of up to 10,000, is accompanied and vitally influenced by a dark reaction and a polymerisation reaction. The dark reaction seems to be essentially heterogeneous, being considerably affected by the nature and pretreatment of the wall of the vessel, whilst the polymerisation is apparently largely a photochemical reaction. The velocity is approx. \propto the absorbed light.

R. C.

Photodecomposition of aldehydes and ketones. R. G. W. NORRISH and C. H. BAMFORD (Nature, 1936, 138, 1016).—Results obtained in the photodecomp. of COMeBu^a and COPr^a_2 in cyclohexane solution are described, and the mechanism of the decomp. is discussed in terms of the length of life of the excited mols.

L. S. T.

Photo-oxidation of carotene.—See this vol., A., II, 54.

Preparation of very pure conductivity water. P. A. THIESSEN and K. HERRMANN (Chem. Fabr., 1937, 10, 18).—A cheap apparatus for the further purification of H_2O of conductivity $1-2 \times 10^{-6} \Omega^{-1}$ consists of a Jena glass flask in which it is treated with a strong current of pure N_2 free from NH_3 and CO_2 at $80-90^\circ$. It is then blown into a quartz glass flask having an additional heating coil around its neck and distilled. The product is of conductivity $< 10 \times 10^{-8} \Omega^{-1}$ and if again distilled $6-8 \times 10^{-8} \Omega^{-1}$.

C. I.

Formation of activated water molecules in high vibrational states in the oxy-hydrogen flame. T. KITAGAWA (Proc. Imp. Acad., Tokyo, 1936, 12, 281—284).—Comparison of the emission spectrum of the H_2-O_2 flame with the absorption bands of H_2O vapour obtained by the author, and isolated from the solar spectrum by Mecke *et al.* (A., 1933, 445, 552) between 5700 and 7000 Å., suggests that activated H_2O mols. are very important intermediate products in the combustion.

R. C. M.

Oxidation of halides of alkali metals by molecular oxygen. V. A. PIANKOV (J. Gen. Chem. Russ., 1936, 6, 1295—1297).—The reaction between HgO and aq. KBr may be represented as $\text{HgBr}_2 + 2\text{KOH}$



R. T.

Sodium hydrogen tripolyphosphate. H. HUBER (Z. anorg. Chem., 1936, 230, 123—128).—By adding EtOH to an aq.-AcOH solution of $\text{Na}_5\text{P}_3\text{O}_{10}$ an oily

layer is obtained which yields crystals of the salt $\text{Na}_5\text{P}_3\text{O}_{10}\cdot\text{Na}_3\text{H}_2\text{P}_3\text{O}_{10}\cdot 3\text{H}_2\text{O}$. $\text{Na}_3\text{H}_2\text{P}_3\text{O}_{10}$ is formed as an intermediate product when $(\text{NaPO}_3)_3$ is prepared by rapid dehydration of NaH_2PO_4 or $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$.
F. L. U.

Thiosilicates. I. Cuprous thiosilicates. L. CAMBI and G. G. MONSELISE (*Gazzetta*, 1936, 66, 696—700).—A thermal study of the system $\text{SiS}_2\text{--Cu}_2\text{S}$ shows the existence of the compound $4\text{Cu}_2\text{S}\cdot\text{SiS}_2$, m.p. 1195°.
O. J. W.

Stability of sodium aurichloride solutions. F. REIMERS (*Dansk Tidsskr. Farm.*, 1936, 10, 297—304).—The stability of aq. NaAuCl_4 (I) has been studied. Solutions containing >0.1% (I) cannot be sterilised by heating at 100° owing to deposition of Au.
M. H. M. A.

Preparation of beryllium nitrate. A. V. NOVOSELOVA (*J. Gen. Chem. Russ.*, 1936, 6, 1306—1309).—Tensimetric and analytical data suggest the hydrates $\text{Be}(\text{NO}_3)_2\cdot 1, 2, 3$, and $4\text{H}_2\text{O}$.
R. T.

Action of carbon dioxide and of carbon monoxide on compact magnesium at high temperatures. R. DELAVAUULT (*Bull. Soc. chim.*, 1936, [v], 3, 2403—2407; cf. A., 1934, 853, 1185).—Below 800° Mg heated in CO reacts only superficially, giving a film of C which does not catalyse the reaction. In dry CO_2 Mg may be heated above 700° without any but a superficial reaction giving rise to CO. If, however, the CO_2 contains either O, or H_2O , combustion ensues.
F. L. U.

Calcium alkali phosphates. I. Rhenania phosphate. H. H. FRANK, M. A. BREDIG, and R. FRANK (*Z. anorg. Chem.*, 1936, 230, 1—27).—The sole ternary product obtainable from the system $\text{Na}_2\text{O--CaO--P}_2\text{O}_5$ at 1000—1400° is NaCaPO_4 , which is present in some specimens of Rhenania phosphate. Specimens of the latter which give an X-ray diagram of "rhenanite" (I) (cf. A., 1932, 1216) contain also combined CO_2 . Starting with pure materials, it is shown that products containing (I) are formed only when CO_2 is present. By heating hydroxyapatite, NaCaPO_4 , or CaHPO_4 with Na_2CO_3 in an atm. of CO_2 the compound $\text{Ca}_4\text{Na}_6(\text{PO}_4)_4\text{CO}_3$ (II) is obtained in a pure state. On heating at 1400° (II) is decomposed quantitatively into CaO , NaCaPO_4 , and Na_3PO_4 . The dissociation pressure (CO_2) is 1 atm. at 1300°. Heating (II) with CaO in an atm. of CO_2 at temp. >800° gives rise to a carbonatoapatite $\text{Ca}_{10}(\text{PO}_4)_6\text{Na}_2(\text{CO}_3)_2$. The Na of (II) can be partly replaced by Ca, and at high temp. the CO_2 can be replaced by SiO_2 . The (I) occurring in technical preps. is a Na-(I) of the latter type. The conditions under which (I) is formed, established by experiments with natural phosphorites, are similar to those which apply to the pure system $\text{CaO--Na}_2\text{O--P}_2\text{O}_5\text{--SiO}_2$.
F. L. U.

Combined action of hydrogen and heat on alkaline-earth arsenates. H. GUERIN (*Compt. rend.*, 1936, 203, 1163—1164).—Tribasic Ca, Sr, and Ba arsenates at 400—450° are reduced to arsenites, which give the metal oxide, As, and H_2O simultaneously or at higher temp. A Ba arsenide is formed above 700°. Pyro- and meta-arsenates are first reduced to the corresponding tribasic orthoarsenates, As_2O_3 , and H_2O .
A. J. E. W.

Preparation of zinc and cadmium cyanides. S. C. WOO and T. K. LIU (*J. Chinese Chem. Soc.*, 1936, 4, 518—521).— $\text{Zn}(\text{CN})_2$ and $\text{Cd}(\text{CN})_2$ are prepared by pptg. MeOH solutions of $\text{Zn}(\text{OAc})_2$ or $\text{Cd}(\text{OAc})_2$ with an Et_2O solution of HCN.
C. R. H.

Precipitation of carbonates. L. CLOUTIER, P. E. PELLETIER, and P. E. GAGNON (*Trans. Roy. Soc. Canada*, 1936, [iii], 30, III, 149—164).—A study has been made of the variation with the concn. of the composition of ppts. formed at room temp. by the mixing of aq. solutions of Zn, Cu, Cd, Mg, Co, and Ni salts with aq. KHCO_3 or K_2CO_3 . ZnCO_3 was formed from 0.05M- $\text{Zn}(\text{NO}_3)_2$ by addition of excess of KHCO_3 . By addition of K_2CO_3 in concn. < approx. 0.15 g.-mol. per litre to 0.05M- $\text{Zn}(\text{NO}_3)_2$, $2\text{ZnCO}_3\cdot 3\text{Zn}(\text{OH})_2$ was formed. At higher concns. of K_2CO_3 , $4\text{ZnCO}_3\cdot 7\text{Zn}(\text{OH})_2$ was pptd. $10\text{CdCO}_3\cdot \text{Cd}(\text{OH})_2$ was formed from 0.05M- $\text{Cd}(\text{NO}_3)_2$ with equimol. concn. of K_2CO_3 , and $5\text{CdCO}_3\cdot \text{Cd}(\text{OH})_2$ with higher concn. of K_2CO_3 . $3\text{MgCO}_3\cdot \text{Mg}(\text{OH})_2$ (I) was formed by pptn. from 0.1M- $\text{Mg}(\text{NO}_3)_2$ by K_2CO_3 in equimol. or higher concns. By stirring in contact with the mother-liquor (I) was converted into MgCO_3 when formed from equimol. solutions and into $4\text{MgCO}_3\cdot \text{Mg}(\text{OH})_2$ in presence of excess of K_2CO_3 . $2\text{NiCO}_3\cdot 5\text{Ni}(\text{OH})_2$ was obtained by addition of K_2CO_3 to 0.05M- $\text{Ni}(\text{NO}_3)_2$. No definite compounds were formed from 0.05M- $\text{Co}(\text{NO}_3)_2$ and K_2CO_3 or from 0.05M- $\text{Cu}(\text{NO}_3)_2$ and KHCO_3 or K_2CO_3 .
O. D. S.

Action of ammonium chloride on sulphides. E. MONTIGNIE (*Bull. Soc. chim.*, 1936, [v], 3, 2321—2322; cf. A., 1936, 1080).— CdS , FeS , Sb_2S_3 , MnS , and MoS_3 are attacked, more or less completely, by conc. aq. NH_4Cl . No action takes place with other heavy metal sulphides.
F. L. U.

Mercury vanadates and xanthates. E. MONTIGNIE (*Bull. Soc. chim.*, 1936, [v], 3, 2322—2324).—The prep. and properties of $\text{Hg}_2(\text{VO}_3)_2$, $\text{Hg}(\text{NO}_3)_2\cdot 3\text{HgO}$, and Hg^{I} and Hg^{II} Et xanthates are described.
F. L. U.

Complex compounds of mercury and copper halides with aliphatic amines. M. STRAUMANIS and A. CIRULIS (*Z. anorg. Chem.*, 1936, 230, 65—87).—The following compounds are described:

$[(\text{NH}_2\text{Et})_2\text{HgBr}_2]$, m.p. 135° (decomp.);
 $[(\text{NH}_2\text{Et})_2\text{HgBr}_2]$, m.p. 145° (decomp.);
 $[(\text{NH}_2\text{Pr}^n)\text{HgBr}_2]$, m.p. 187° (decomp.);
 $[(\text{NH}_2\text{Me})_2\text{HgBr}_2]$; $[(\text{NH}_2\text{Et})\text{HgI}_2]$, m.p. 14°;
 $[(\text{NH}_2\text{Et})_2\text{HgI}_2]$, m.p. 57—62°; $[(\text{NH}_2\text{Pr}^n)_2\text{HgI}_2]$, m.p. 45—47°; $[(\text{NH}_2\text{Pr}^n)\text{HgI}_2]$, m.p. 0°;
 $[(\text{NH}_2\text{Bu}^n)_2\text{HgI}_2]$, m.p. 56°; $[(\text{NHMe})_2\text{HgI}_2]$, m.p. 83°; $[(\text{NH}_2\text{Et})_2\text{HgI}_2]$, m.p. 101°; $[\text{enHgI}_2]$, m.p. 103°;
 $[\text{Hg}(\text{NH}_2\text{Et})_4]\text{I}_2$, m.p. -4°; $[\text{Cu}^{\text{II}}(\text{NH}_2\text{Et})_4]\text{Cl}_2$; $[\text{Cu}^{\text{II}}(\text{NH}_2\text{Et})_2]\text{Br}_2$; $[\text{Cu}^{\text{II}}(\text{NH}_2\text{Et})_2(\text{H}_2\text{O})_2]\text{I}(\text{OH})$; $[\text{Cu}^{\text{II}}(\text{NH}_2\text{Et})_4]\text{I}_2$; $[\text{Cu}^{\text{II}}(\text{NH}_2\text{Me})_4][\text{HgI}_4]$; $[\text{Cu}^{\text{I}}(\text{NH}_2\text{Me})_2]_2[\text{HgI}_4]$; $7\text{CuI}\cdot \text{HgI}_2\cdot 7\text{NH}_2\text{Me}$.
F. L. U.

Autoxidation of the complex metallic compounds of gluconic acid.—See A., II, 49.

Metallic complex salts of aliphatic polyhydroxy-compounds. See A., II, 48.

Crystalline boron. D. P. MELLOR, S. B. COHEN, and E. B. UNDERWOOD (*Proc. Austral. Chem. Inst.*, 1936, 3, 329—333).—Cryst. B was prepared by reduc-

ing BBr_3 (synthesised from Br and amorphous B at 700°) with H_2 at a low temp. produced by a W filament; crystallisation of B from molten Cu was unsuccessful. The dark grey solid, containing 0.005% of Si, had mean d 2.36, hardness ± 13 (revised Moh scale); 22 spacings obtained from Hull powder photographs are recorded, of which 2.59 and 2.11 Å. correspond with the most intense lines. There is evidence that the mol. is three-dimensional. Powder photographs of amorphous B (Moissan's method) showed no evidence of cryst. suboxides, but the most intense band (corresponding with a spacing of approx. 4.9 Å.) indicated that a large proportion of the specimen was amorphous. J. G.

Boron hydrides. XXV. Parachor of diborane B_2H_6 . A. STOCK, E. WIBERG, and W. MATHING (Ber., 1936, 69, [B], 2811—2815).—The observed val. (121.9) for the parachor of B_2H_6 harmonises best with Wiberg's formulation $(\text{B}-\text{H}_2:\text{B}-\text{H}_2)\text{H}_2^+$ according to which it is composed of 2 single parachors for 2 B atoms (2×16.4), 4 H atoms (4×17.1), a double linking (23.2), and 2 electrovalencies (-2×1.6) = 121.2. Slight uncertainty is introduced with regard to d . H. W.

Present knowledge of the structure of boron hydrides. E. WIBERG (Ber., 1936, 69, [B], 2816—2842).—According to chemical and physical properties the known B hydrides are divisible into two groups, B_nH_{n+4} (B_2H_6 , B_3H_8 , B_4H_{10} , $\text{B}_{10}\text{H}_{14}$) and B_nH_{n+6} (B_3H_{10} , B_5H_{12} , B_6H_{12}). At present experimentally established structural formulæ can be assigned only to the initial member of each series, B_2H_6 and B_4H_{10} . They are obtained by comparison of the chemistry of B with that of C and N and are best written $\text{BHH}_2:\text{BHH}_2$ and $\text{BHH}:\text{BHH}:\text{BHH}:\text{BHH}_2$ (simplified $[\text{B}_2\text{H}_4]\text{H}_2$ and $[\text{B}_4\text{H}_6]\text{H}_4$ or $\text{BH}_3:\text{BH}_3$ and $\text{BH}_3:\text{BH}_2:\text{BH}_3:\text{BH}_3$), respectively. They are therefore unsaturated, polybasic acids comparable with C_2H_4 and butadiene in electronic arrangement. The acidic character is established by salt formation with NH_3 . In accordance with the formulæ B_2H_6 and B_4H_{10} unite with 2 and 4 mols. of NH_3 , respectively, giving $[\text{B}_2\text{H}_4][\text{NH}_4]_2$ and $[\text{B}_4\text{H}_6][\text{NH}_4]_4$. As salts, these compounds conduct the current when in solution. The different union of H in B_2H_6 and B_4H_{10} can also be established from the non-acidic side since in B_2H_6 a max. of 4 and in B_4H_{10} of 6 H are replaceable by univalent groups, e.g., $[\text{B}_2\text{Me}_4]\text{H}_2$, $[\text{B}_4(\text{NH}_2)_6]\text{H}_4$. The acidic nature of the substituted products follows from their undiminished power of salt formation with NH_3 . The unsaturated character of boranes is established by their power of adding atoms of alkali metal, giving thus $\text{Na}[\text{NH}_3:\text{BH}_3]\text{Na}$, $\text{Na}[\text{NH}_3:\text{BH}_2:\text{BH}_2:\text{BH}_3]\text{Ba}$. It is also proved by measurements of the ultra-violet absorption spectrum, which show the analogy of B_2H_6 with C_2H_4 and not C_2H_6 and explain simply the behaviour of the boranes towards H_2O and H halides: $\text{BH}_3:\text{BH}_3 + \text{HX} \rightarrow \text{BH}_4:\text{BH}_3\text{X} \rightarrow \text{BH}_3:\text{BH}_2\text{X} + \text{H}_2$. Measurements of dipole and parachor and magnetic observation extend and confirm the chemical evidence. H. W.

Additive product of boron fluoride and potassium sulphate. P. BAUMGARTEN and E. MÜLLER (Ber., 1936, 69, [B], 2688—2690).—Passage of BF_3

over K_2SO_4 at about 240° gives the compound $\text{K}_2\text{SO}_4 \cdot \text{BF}_3$ which when further heated gives a colourless distillate containing B and F; BF_3 thus resembles SO_3 . H. W.

Preparation of crystalline aluminium orthoarsenate. F. MACHATSCHKI and A. MOSER (Naturwiss., 1936, 24, 743).—Repetition of the work of Goguel (Diss., Paris, 1894) on the prep. of doubly refracting, octahedral crystals of AlAsO_4 gave only cubic crystals of As_2O_3 . Good crystals of AlAsO_4 of the quartz type were obtained by prolonged heating at 250° in a sealed tube of the ppt. obtained by mixing solutions of H_3AsO_4 and NaAlO_2 , and of $\text{Al}_2(\text{SO}_4)_3$ and K_2HAsO_4 . The physical properties of quartz, AlPO_4 , and AlAsO_4 are compared. A. J. M.

Measurements on gallium and indium compounds. XI. Fluorides of gallium, indium, and thallium. O. HANNEBOHN and W. KLEMM (Z. anorg. Chem., 1936, 229, 337—351; cf. A., 1934, 1081).— GaF_3 (sublimes at 950°) is obtained by heating $(\text{NH}_4)_3\text{GaF}_6$ (I) in F_2 at 250 — 400° ; decomp. of (I) in air leads to ammonolysis, with the successive formation of $\text{Ga}(\text{NH}_2)\text{F}_2$ at 220° , and GaNHf at 400° . The action of F_2 on Ga_2O_3 , Ga_2S_3 , or Ga_2Te_3 leads to only partial conversion into GaF_3 at all temp. After ignition at 1000° , and consequent recrystallisation, Ga_2S_3 is attacked very slowly by F_2 . InF_3 (m.p. 1170° , b.p. 1200°) is obtained by the action of F_2 on the salt $(\text{NH}_4)_3\text{InF}_6$, or on In_2O_3 ; TlF_3 , m.p. 550° , results similarly from Tl_2O_3 . GaF_3 is not reducible by H_2 , but InF_3 above 275° forms In_2F_4 , which is shown to be dimeric by its diamagnetic properties. Physical properties, d , and mol. vol. increments are discussed. J. S. A.

Combustion of cyanogen. R. DOLIQUE (Bull. Soc. chim., 1936, [v], 3, 2347—2359).—When the mixture $(\text{CN})_2 + \text{O}_2$ is sparked only 86% of the $(\text{CN})_2$ reacts according to the usual equation, and small quantities of CO_2 , C, and N_2O are formed. With $(\text{CN})_2 + 2\text{O}_2$, CO, NO, and NO_2 are produced in addition to the products of the main reaction. With $(\text{CN})_2 + 3\text{O}_2$ no CO is found after combustion, but 5% of the N appears as NO_2 . F. L. U.

Hydrates of molecular compounds of zirconyl oxalate with oxalic acid and alkali oxalates. (MLLE.) J. BOULANGER (Compt. rend., 1936, 203, 1257—1259).—The dehydration on heating of salts of the type $\text{ZrO}(\text{CO}_2)_2 \cdot \text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{M}_2\text{C}_2\text{O}_4 \cdot n\text{H}_2\text{O}$ ($\text{M} = \text{Li}$, Na, K, Rb, Cs, or NH_4) has been investigated. Vals. of n and heats of dissolution are given for the hydrates observed, and the binding energies of the H_2O mols. deduced. A. J. E. W.

Basic lead sulphates. G. L. CLARK, J. N. MRGUDICH, and N. C. SCHIELTZ (Z. anorg. Chem., 1936, 229, 401—409).—From an X-ray study of basic Pb sulphates prepared in various ways, the existence of $4\text{PbO} \cdot \text{PbSO}_4$, $2\text{PbO} \cdot \text{PbSO}_4$, and probably $3\text{PbO} \cdot \text{PbSO}_4$ is confirmed. The role of H_2O in the compounds is neglected. J. S. A.

Action of ammonium chloride with nitric acid on various compounds. E. MONTIGNIE (Bull. Soc. chim., 1936, [v], 3, 2320—2321).—A saturated solu-

tion of NH_4Cl to which HNO_3 has been added behaves in many respects like aqua regia. F. L. U.

Constitution of solid phosphorus hydride. P. ROYEN (Z. anorg. Chem., 1936, 229, 369—400).—The solid P hydride (I) obtained by the decomp. of P_2H_4 is variable, and not stoichiometric in composition, and is not justifiably represented as a definite compound P_{12}H_6 . (I) is amorphous (X-rays). PH_3 is evolved on heating, but no H_2 at temp. below the dissociation temp. of PH_3 . The rate of decomp. falls with decreasing H content, but shows no discontinuity at the composition P_5H_2 . The solid hydrides are therefore regarded as sorption complexes of PH_3 in a yellow amorphous form of P; desorption is irreversible, but in liquid NH_3 , NH_3 may be adsorbed, displacing PH_3 and giving an apparent additive compound. Piperidine similarly displaces PH_3 partly, but the black "salt" is not stoichiometric in composition, and is an adsorption complex. In confirmation, on irradiation of white P in PH_3 under 30—40 atm. pressure, an amorphous product containing up to 14 wt.-% of PH_3 is obtained. Amorphous P similarly adsorbs PET_3 from CS_2 solution; a similar product is obtained by partial displacement of PH_3 from (I) by PET_3 . J. S. A.

Extraction of sulphur from metallic sulphides. A. SOARE and V. PAVLU (Bul. Chim. Soc. Romane, 1935—1936, 38, 143—144).—Half of the S in FeS_2 is obtained as a sublimate and half as H_2S and CS_2 by treatment at 400—1000° in presence of CH_4 . D. C. J.

Use of chromous sulphate in the removal of oxygen from a stream of gas. Comparison with other oxygen absorbents. H. W. STONE (J. Amer. Chem. Soc., 1936, 58, 2591—2595).— $\text{CrSO}_4\text{--H}_2\text{SO}_4$ solutions rapidly absorb O_2 from a stream of N_2 . The relative rates of absorption of O_2 by other reagents have been determined. E. S. H.

Reaction of hydrogen peroxide with chromic anhydride in dry ethyl acetate. D. G. NICHOLSON (J. Amer. Chem. Soc., 1936, 58, 2525—2526).—The blue compound formed gives an NH_4 salt corresponding with $\text{H}_2\text{CrO}_5\cdot 2\text{NH}_3$. The blue compound is probably H_2CrO_5 or $\text{CrO}_3\cdot\text{H}_2\text{O}_2$. E. S. H.

Complex compounds with two co-ordination shells from hexamminechromic and triethylenediaminechromic ions. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1936, 229, 410—412).—From measurements of ionic diffusion rates, the existence of the following ions in solutions of $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{Cr en}_3]^{3+}$ in aq. $(\text{NH}_4)_2\text{SO}_4$, K_2HPO_4 , $\text{K}_2\text{C}_2\text{O}_4$, and K_2HASO_4 is inferred: $[[\text{Cr}(\text{NH}_3)_6]\text{X}_4]^{3+}$, $[[\text{Cr en}_3]\text{X}_4]^{3+}$, $[[\text{Cr en}_3](\text{C}_2\text{O}_4)]^{3+}$, where $\text{X} = \text{SO}_4$, HPO_4 , or HASO_4 [$\text{en} = (\text{CH}_2\text{NH}_2)_2$]. J. S. A.

Attempt to prepare FO: identification of gases resulting from thermal decomposition of F_2O_2 . P. FRISCH and H. J. SCHUMACHER (Z. anorg. Chem., 1936, 229, 423—428).—The products of thermal decomp. of F_2O_2 at -60° to -25° (cf. A., 1934, 378) agree in absorption spectrum, v.p., b.p., m.p., and action on 30% aq. HI with the properties of an equimol. $\text{F}_2\text{--O}_2$ mixture. It is concluded that FO has no real existence. J. S. A.

Tervalent manganese chloride. A. CHRETIEN and G. VARGA (Bull. Soc. chim., 1936, [v], 3, 2385—2394).—*Mn trichloride*, prepared by the action of HCl on $\text{Mn}(\text{OAc})_3$ at -100° , forms a brown cryst. mass giving green solutions in various org. solvents, e.g., EtOH and AcCl . The formula, from cryoscopic measurements in liquid HCl , is MnCl_3 . MnCl_3 is decomposed irreversibly above -40° into MnCl_2 and Cl_2 . F. L. U.

Active iron. VII. Ferric salt catalase. A. SIMON, W. HAUFFE, T. REETZ, and R. PREISSLER. **VIII. Prussian-blue reaction.** **IX. Reactions with 2:2'-dipyridyl and o-phenanthroline.** A. SIMON and W. HAUFFE (Z. anorg. Chem., 1936, 230, 129—147, 148—159, 160—175; cf. A., 1931, 439).—VII. On the assumption that the catalase activity of Fe salts is due to Fe^{3+} , which in presence of H_2O_2 is in equilibrium with Fe^{2+} , the relative activity of different Fe^{3+} salts should increase with the $[\text{Fe}^{3+}]$ furnished by them. Velocity coeffs. for the decomp. of H_2O_2 in presence of $\text{Fe}(\text{ClO}_4)_3$, FeCl_3 , $\text{Fe}(\text{NO}_3)_3$, $\text{NH}_4\text{Fe}(\text{SO}_4)_2$, $\text{Fe}_2(\text{SO}_4)_3$, $\text{Fe}(\text{OAc})_3$, FePO_4 , and FeF_3 at 1—5 are in the decreasing order given. The same order is found for the $[\text{Fe}^{3+}]$ in equiv. solutions of the salts named. The activity of any given salt increases with rise in p_{H} . In all cases the velocity of decomp. of H_2O_2 increases rapidly at first, owing to the formation of Fe^{2+} from Fe^{3+} , whilst it decreases later, increasingly so with increasing p_{H} , on account of hydrolysis. The $\text{Fe}^{2+} \rightleftharpoons \text{Fe}^{3+}$ equilibrium is influenced by p_{H} in the sense represented by: $\text{Fe}^{3+} + \text{HO}_2' \rightarrow \text{Fe}^{2+} + \text{HO}_2$ (high p_{H}), $\text{Fe}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{Fe}^{3+} + \text{OH}' + \text{OH}$ (low p_{H}).

VIII. The reaction between Fe^{II} salts and $\text{K}_3\text{Fe}(\text{CN})_6$ in aq. solution proceeds in two stages, viz., (1) $\text{Fe}^{2+} + [\text{Fe}(\text{CN})_6]^{3-} \rightarrow \text{Fe}^{3+} + [\text{Fe}(\text{CN})_6]^{4-}$, (2) $4\text{Fe}^{2+} + 3[\text{Fe}(\text{CN})_6]^{3-} \rightarrow \text{Fe}^{III}_4[\text{Fe}^{II}(\text{CN})_6]_3$. The production of Fe^{3+} from Fe^{II} salts by H_2O_2 has been followed by adding $\text{K}_3\text{Fe}(\text{CN})_6$ to the mixture and measuring the colour change. The salts used were $\text{Fe}(\text{ClO}_4)_3$, FeCl_3 , $\text{Fe}(\text{NO}_3)_3$, $\text{NH}_4\text{Fe}(\text{SO}_4)_2$, and $\text{Fe}_2(\text{SO}_4)_3$, all at 2. The initial rate of production of Fe^{3+} decreases in the order named, parallel with the initial $[\text{Fe}^{2+}]$. The results show that the catalase effect varies in the same sense as does the $[\text{Fe}^{2+}]$.

IX. In the production of the red complex $[\text{Fe}^{II} \text{dip}_2]\text{X}_2$ in a solution of FeX_3 , H_2O_2 , and 2:2'-dipyridyl, the rate-determining reaction is $\text{Fe}^{3+} + \text{HO}_2' \rightarrow \text{Fe}^{2+} + \text{HO}_2$, and the colour change can therefore be used to follow the formation of Fe^{2+} . The results so obtained confirm those given by the use of $\text{K}_3\text{Fe}(\text{CN})_6$. Similar results are obtained with o-phenanthroline. F. L. U.

Iron perchlorates. I. F. LINDSTRAND (Z. anorg. Chem., 1936, 230, 187—208).—The prep. of cryst. $\text{Fe}(\text{ClO}_4)_2$ (4, 5, and 6 H_2O) and $\text{Fe}(\text{ClO}_4)_3$ (6, 9, and 10 H_2O) is described. Solubilities in H_2O , aq. HClO_4 , and EtOH have been determined, and the sp. gr. of the saturated aq. solutions are given. $\text{Fe}(\text{ClO}_4)_2$ is stable in dry air, but deliquesces and becomes oxidised in ordinary air. The aq. solution is less affected by air than is FeCl_3 or FeSO_4 . F. L. U.

Decomposition of cadmium ferrite. H. FORESTIER and F. REDSLOB (Compt. rend., 1936, 203,

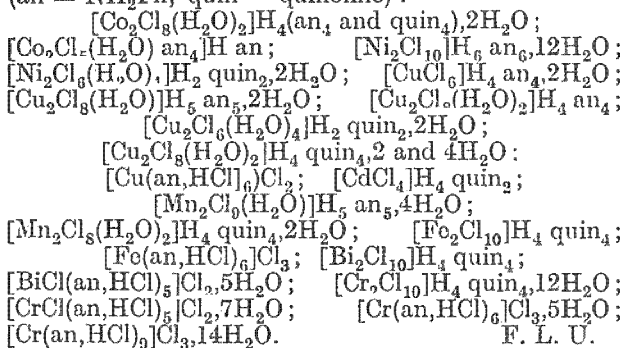
1160—1162).—Ferromagnetism in $\text{Fe}_2\text{O}_3\cdot\text{CdO}$ observed on heating depends on the presence of H_2O , which hydrolyses the ferrite with production of cubic Fe_2O_3 .

A. J. E. W.

Gmelin's reaction. G. SCAGLIARINI (Gazzetta, 1936, 66, 693—695).—The work of Raurich Sas (cf. A., 1936, 948) is criticised.

O. J. W.

Complex heavy metal halides. J. V. DUBSKY and E. WAGENHOFER (Z. anorg. Chem., 1936, 230, 112—122).—Previous work (A., 1935, 946) has been extended by the prep. of the following compounds (an = NH_2Ph , quin = quinoline):



F. L. U.

Spectrographic methods of studying unstable compounds. II. Aquotisation of *trans*-dichlorotetramminocobaltic chloride in aqueous solutions. R. TSUCHIDA (Bull. Chem. Soc. Japan, 1936, 11, 721—734; cf. A., 1935, 446).—Analysis of the absorption spectra of aq. solutions of $[\text{Co}(\text{NH}_3)_4\text{Cl}_2(1\ 6)]\text{Cl}$ (I) at intervals after dissolution has been made by comparison with the known spectrum of $[\text{Co}(\text{NH}_3)_4\text{ClH}_2\text{O}(1\ 2)]\text{Cl}_2$ (II), which is identical with that of the solution 90 min. after dissolution. It is concluded that an intermediate product, $[\text{Co}(\text{NH}_3)_4\text{ClH}_2\text{O}(1\ 6)]\text{Cl}_2$ (III), is first formed from (I) and converted through (II) into $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2(1\ 2)]\text{Cl}_2$. The velocity coeffs. of the first two reactions are calc. The absorption spectra of (I) and (III) are deduced.

O. D. S.

Basic salts. XV. Chemistry and morphology of basic salts of bivalent metals. V. Basic cobalt nitrates. W. FEITKNECHT and G. FISCHER (Helv. Chim. Acta, 1936, 19, 1242—1255).—Incomplete pptn. of dil. ($>2M$) aq. $\text{Co}(\text{NO}_3)_2$ with dil. aq. NaOH yields the bluish-green basic nitrate $\text{Co}(\text{NO}_3)_2\cdot 6\text{Co}(\text{OH})_2$ (I). It varies in structure according to its method of prep. and age. At room temp. it is in equilibrium with $\text{Co}(\text{OH})_2$ in 0.35*M*-solution and at 100° in 0.4*M*-solution. Near the equilibrium concn. the change into $\text{Co}(\text{OH})_2$ is very rapid, but preps. free from $\text{Co}(\text{OH})_2$ can be kept for long periods in more dil. solution. The stability is increased by slight oxidation. At higher concns. (I) passes into the rose-coloured basic nitrate, $\text{Co}(\text{NO}_3)_2\cdot 3\text{Co}(\text{OH})_2$ (II). This change is rapid at 100° for solutions above 0.6*M*, but at room temp. the change is observed only with 1.8*M* solutions, although the equilibrium concn. is $<$ at 100°. Although (II) is formed only in relatively conc. solutions it is only slightly decomposed by H_2O .

J. W. S.

Reaction between ammonium salts and complex nitro-derivatives of cobalt. J. J. FLAKAN

(Ann. Leningrad State Univ., Chem. Ser., 1935, 1, 72—104).—The reaction $[\text{Co}(\text{NH}_3)_x(\text{NO}_2)_y]\text{Cl}_z + y\text{NH}_4\text{X} = [\text{Co}(\text{NH}_3)_x\text{X}_y]\text{Cl}_z + y\text{N}_2 + \text{H}_2\text{O}$ takes place quantitatively when $\text{X} = \text{I}$. With different X , the % elimination of NO_2 -N rises in the series $\text{F} < \text{Cl} < \text{Br} < \text{I}$; $\text{H}_2\text{PO}_4 < \text{SO}_4$. The reaction is unaffected by lowering the p_{H} of the medium or by increasing the reaction time beyond 40 min. R. T.

Complex salts of phenylhydrazone-oximes [of diketones] and of phenanthraquinone-mono- and -di-oximes.—See A., II, 24.

Action of chlorides on oxides. E. MONTIGNIE (Bull. Soc. chim., 1936, [v], 3, 2319—2320).— $\text{Ni}(\text{OH})_2$ with aq. CuCl_2 , ZnCl_2 , or FeCl_3 gives NiCl_2 and the corresponding hydroxide. A similar metathesis occurs with $\text{Cu}(\text{OH})_2$ and FeCl_3 . By suitable choice of proportions oxychlorides of both metals may be formed.

F. L. U.

Separation of metallic nickel from solutions of its salts by the action of metallic zinc or iron. S. A. PLETENEV and C. E. FISCHKOVA (J. Appl. Chem., Russ., 1936, 9, 1394—1399).—The following reactions take place when Zn or Fe is added to neutral aq. NiSO_4 : $\text{Zn} + 2\text{H}_2\text{O} \rightarrow \text{Zn}(\text{OH})_2 + \text{H}_2$; $\text{Zn}(\text{OH})_2 + \text{NiSO}_4 \rightarrow \text{ZnSO}_4 + \text{Ni}(\text{OH})_2$. If acid in amount equiv. to the H_2 produced is added during the reaction, the ppt. consists of a mixture of Ni and $\text{Ni}(\text{OH})_2$.

R. T.

Action of nitric oxide on nickel carbonyl. J. S. ANDERSON (Z. anorg. Chem., 1936, 229, 357—368).—NO reacts with $\text{Ni}(\text{CO})_4$, dissolved in C_6H_6 , Et_2O , CHCl_3 , or C_6H_{14} , only in presence of traces of H_2O , forming small amounts of a deep blue substance, $\text{Ni}(\text{NO})\text{OH}\cdot 1.5-2\text{H}_2\text{O}$ (I). (I) is sol. in H_2O , oxidises rapidly in air, and is decomposed by acids whereby NO, N_2 , and smaller amounts of N_2O are liberated in amounts indicating a reducing power of 1 atom of H per mol. of NO present. AgNO_3 is reduced to Ag, indicating that (I) is a compound of univalent Ni. With $\text{C}_5\text{H}_5\text{N}$, (I) forms the compound $\text{Ni}(\text{NO})\text{OH}\cdot \text{C}_5\text{H}_5\text{N}$. In MeOH solution, the prolonged action of NO on $\text{Ni}(\text{CO})_4$ gives a green substance (cf. A., 1930, 1539) which gives chiefly N_2O with acids, does not reduce AgNO_3 , and is regarded as a hyponitrite, $[\text{Ni}_2(\text{OH})_2(\text{MeOH})_4]\text{N}_2\text{O}_2$ (II). In the initial stages of the reaction, a blue substance (III) may be isolated, similar in properties to (I), but isomeric with (II), into which it is converted when kept in solution or in the solid state. By analogy with (I), (III) is formulated as $\text{Ni}(\text{NO})\text{OH}\cdot 2\text{MeOH}$ or $\text{Ni}(\text{NO})\text{OMe}\cdot \text{MeOH}\cdot \text{H}_2\text{O}$. EtOH solutions similarly give the stable compound $\text{Ni}(\text{NO})\text{OH}\cdot \text{EtOH}$ or $\text{Ni}(\text{NO})\text{OEt}\cdot \text{H}_2\text{O}$ (IV). (I), (III), and (IV) are converted by KCN or $\text{K}_2\text{S}_2\text{O}_8$ into the known compounds, $\text{K}_2[\text{Ni}(\text{NO})(\text{CN})_3]$ and $\text{K}_2[\text{Ni}(\text{NO})(\text{S}_2\text{O}_3)_2]\cdot 2\text{H}_2\text{O}$. The relation of (I) to the Cu^I carbonyl halides and to the carbonyls is discussed.

J. S. A.

Action of ammonia on solutions of rhodium chloride. V. V. LEBEDINSKI (Ann. Sect. Platine, 1936, 13, 9—17).— NH_4Cl to 20% and 1.5—2 vols. of boiling aq. NH_3 are added to boiling aq. RhCl_3 , when pure $[\text{Rh}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ is pptd. in good yield. R. T.

Separation of rhodium from platinum residues. V. V. LEBEDINSKI (Ann. Sect. Platine, 1936, 13, 73—94).—Rh is pptd. as $[\text{Rh}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$, which is purified by dissolving in HNO_3 and repptg. with HCl . The method serves for isolation of Rh from its mixtures with Ir, Pd, and Pt salts. R. T.

Oxidation of *cis* and *trans* bivalent platinum non-electrolytes by nitric acid. I. I. TSCHERNIAEV and A. V. BABAEVA (Ann. Sect. Platine, 1936, 13, 59—61).— Pt^{II} complexes of the type PtB_2X_2 [$\text{B}_2 = (\text{NH}_3)_2, (\text{C}_5\text{H}_5\text{N})_2, \text{en}$; $\text{X} = \text{Cl}, \text{NO}_2$] react with anhyd. HNO_3 as follows: $\text{PtB}_2\text{X}_2 + 2\text{HNO}_3 \rightarrow \text{PtB}_2\text{X}_2(\text{OH})_2$ (I) + 2NO_2 ; (I) + $2\text{HNO}_3 \rightarrow \text{PtB}_2\text{X}_2\text{NO}_2\text{NO}_3 + 2\text{H}_2\text{O} + \text{O}$. Complexes of the type $\text{PtB}_2(\text{NO}_2)\text{NO}_2\text{NO}_3$ are converted by H_2O into $\text{PtB}_2(\text{NO}_2)\text{NO}_2\cdot\text{OH}$. The configuration of the original complexes (*cis* or *trans*) is unaffected by the reaction, except in presence of H_2O , when migration of the groups occurs to a certain extent. R. T.

Isomerism of ethylene compounds of platinum.—See A., II, 54.

Colorimetric determination of p_{H} . A. HAHN and A. KRETSCHMANN (Z. Biol., 1936, 97, 585—589).—The p_{H} of a solution can be calc. from the dissociation const. of an added indicator and from a colorimetric measurement of the extent of dissociation of the indicator. The indicator must be colourless in its undissociated form. The average deviation from the p_{H} vals. measured electrometrically is 0.05. The method can be modified for urine p_{H} determinations. E. A. H. R.

Applicability of the antimony electrode to the determination of p_{H} . H. YOSHIMURA (Japan. J. Med. Sci., 1936, III, 4, 131—141).—The potential of a Sb electrode is higher in McIlvaine's buffer than in a PO_4''' buffer of the same p_{H} . In acid solutions of the former, the time of equilibration is longer and reproducibility is lessened, probably on account of the formation of a sol. complex of Sb with citrate. The state of deposition of Sb affects the relation between potential and p_{H} , and except for plated electrodes in PO_4''' buffer, where reproducibility is good, the Sb electrode is not suitable for p_{H} determinations, and cannot be used for biological purposes. E. A. H. R.

Systematic analysis of anions. T. P. CHAO (J. Chinese Chem. Soc., 1936, 4, 443—456).—Twenty-six anions are divided into five groups. Group I: anions pptd. by $\text{Ca}(\text{NO}_3)_2$ (I), viz., CO_3'' , $\text{C}_2\text{O}_4''$, F' , SiO_3'' , PO_4''' , AsO_2' (if in large amount), AsO_4''' , SO_3'' (partly), and tartrate (if in large amount). Group II: not pptd. by (I) but pptd. by $\text{Ba}(\text{NO}_3)_2$ (II), viz., SO_4'' , SO_3'' , and CrO_4'' . Group III: not pptd. by (I) or (II) but pptd. by $\text{Ni}(\text{NO}_3)_2$ (III), viz., S'' , CN' , $\text{Fe}(\text{CN})_6'''$, $\text{Fe}(\text{CN})_6'''$, and AsO_2' . Group IV: not pptd. by (I), (II), or (III) but pptd. by AgNO_3 (IV), viz., $\text{S}_2\text{O}_3''$, CNS' , I' , Br' , Cl' , and BO_2' (not too trustworthy on account of hydrolysis of AgBO_2). Group V: not pptd. by (I), (II), (III), or (IV), viz., ClO_3' , OCl' , OAc' , NO_2' , and BO_2' . Tartrate, NO_3' , and CO_3'' are preferably identified in the original sample. Details are given for separating and identifying the anions in each group. C. R. H.

Properties of the silver electrode and the titration of the total and active chlorine ion in organisms. J. L. TREMBLAY (Natural. Canad., 1936, 63, 269—352).—The potentiometric determination of Cl' by means of a Ag electrode has been investigated. In presence of Br' and I' separate determinations of the ions are possible only if $[\text{Cl}']$, $[\text{Br}']$, and $[\text{I}']$ are of the same order of magnitude. The conditions for stability of different Ag ions for varying degrees of salinity and vals. of p_{H} have been found, the stable forms indicated being $(\text{Ag}_2)'$, corresponding with Ag_4O , below p_{H} 2; Ag' at p_{H} 2—6; Ag'' at p_{H} 6—10 or 11; and a new ion, corresponding with Ag_4O_3 or Ag_4O_5 , above p_{H} 11. The theory of the Ag—AgCl electrode is discussed. The e.m.f. is not greatly affected by changes in p_{H} except for high or low vals. of p_{H} combined with low $[\text{Cl}']$. The temp. coeff. is 0.42 mv. per 1° between 10° and 40° . A technique has been developed for determining Cl' activity in circulating blood and in other biological liquids, and a series of determinations of Cl' activity in sea-waters is recorded. Data for gelatin solutions have been successfully applied to the confirmation of Donnan's equilibrium theory. C. R. H.

Inaccuracies in micro-iodometry. V. A. PIANKOV (J. Gen. Chem. Russ., 1936, 6, 1365—1367).—The amount of I liberated from aq. KI by O_2 varies with the $[\text{KI}]$, and is greater in acid than in neutral solutions. Determination of small amounts of oxidising substances (Br , $\text{K}_2\text{Cr}_2\text{O}_7$) should be performed in presence of low $[\text{KI}]$ and in an atm. of CO_2 . R. T.

Potentiometric iodide-silver titration at extreme dilutions. I. M. KOLTHOFF and J. J. LINGANE (J. Amer. Chem. Soc., 1936, 58, 2457—2459).—The procedure is suitable for the determination of as little as 0.05 p.p.m. of Ag' with an error of 3%, using a 500-c.c. sample. Large amounts of $\text{Ba}(\text{NO}_3)_2$ are without influence, but high $[\text{SO}_4''']$ introduces a considerable positive error. E. S. H.

Effect of fluorides on spectral absorption of some iron compounds. Colorimetric determination of fluorine. W. WEYL (Oesterr. Chem.-Ztg., 1936, 39, 187).—The strongly coloured compounds of Fe^{III} with CNS', thiosalicylic acid, etc. are decolorised by F' , owing to the formation of $[\text{FeF}_6]'''$. The reaction is proposed for the determination of small amounts of F . J. S. A.

Spectrographic detection of fluorine. W. PAUL (Angew. Chem., 1936, 49, 901—902).—The sample is heated with $\text{SiO}_2 + \text{H}_2\text{SO}_4$, forming SiF_4 , which is distilled over and hydrolysed in a few drops of KOH , contained in a microbeaker, the prep. of which from a $\text{PbO}-\text{B}_2\text{O}_3$ glass free from SiO_2 is described. The beaker is melted down in a Pt crucible to a uniform glass, which is coated on Cu electrodes and arced. The presence and approx. amount of F are determined from the occurrence and intensity of Si lines in the spectrum. The limit of detection is <0.1 mg. J. S. A.

Catalytic determination of oxygen in gas mixtures. O. V. NEKRASOVA and M. S. PLATONOV (J. Appl. Chem. Russ., 1936, 9, 1529—1534).—A known vol. of gas, containing O_2 , CO_2 , CO , and excess of H_2 ,

is passed over fireclay impregnated with Pd (2%), at 150°, and the O₂ content is derived from the vol. change. Catalysts of a higher Pd content, or containing Pt, also catalyse oxidation of CO, leading to fictitious low results.

R. T.

Micro-determination of sulphides. A. J. C. HALL (Soc. Chem. Ind. Victoria, 1936, 36, 1113—1117).—Feigl's use of Raschig's reaction of NaN₃ with I (A., 1934, 790; 1935, 711) is described. J. S. A.

Stability of potassium thiocyanate solutions. F. H. CAMPBELL (Soc. Chem. Ind. Victoria, 1936, 36, 1106—1107).—Contrary to published statements, 0.1N-KCNS does not change in titre on keeping, and addition of C₅H₁₁-OH has no beneficial effect.

J. S. A.

Co-precipitation of various ions in precipitation of sulphate as barium sulphate. Z. KARAOGLANOV (Z. physikal. Chem., 1936, 178, 143—156).—The pptn. of BaSO₄ from a mixture of H₂SO₄ and a Ba salt in presence of various ions has been examined. The effect of a foreign cation on the wt. of the ppt. is the greater the smaller is the solubility of its sulphate, and the effect of an anion is the greater the smaller is the solubility of its Ba salt. This result may be explained by supposing that concurrently with the pptn. of BaSO₄ there occur secondary pptns. in which foreign ions participate, e.g., 2KSO₄' + Ba'' = Ba(KSO₄)₂, the solubility of such a secondary product being \propto the solubility of the electrolyte from which it is formed (cf. A., 1936, 1220). The observed effects cannot be explained by adsorption, and it seems that the capacity of BaSO₄ to co-ppt. other substances is independent of the sign of the charge on its surface.

R. C.

Reduction and volumetric determination of the selenic ion by hydrochloric acid. R. DOLIQUE (Ann. Chim. Analyt., 1936, [iii], 18, 313—315).—The material is heated with HCl (40 vol.-%), and Cl₂ liberated is carried in a stream of CO₂ into KI. The I liberated is titrated with Na₂S₂O₃. The accuracy of the method is highly dependent on empirical factors.

J. S. A.

Detection and determination of phosphates in presence of salts of arsenic and other acids. I. M. KORENMAN (J. Appl. Chem. Russ., 1936, 9, 1507—1509).—2 ml. of 2N-H₂SO₄ and 0.2 ml. each of 6% molybdic acid and 3% strychnine nitrate are added to 3 ml. of solution, when turbidity appears in presence of $\leq 10^{-6}$ g. of PO₄'''. AsO₄''', SiO₃'', NO₃', SO₄'', Cl', Ca'', and NH₄' do not interfere, except when present in very great excess. PO₄''' can be determined nephelometrically, using the above reaction, with a mean error of 8% for amounts of 4—18 $\times 10^{-6}$ g.

R. T.

Sensitive reaction for boric acid. F. P. ZORKIN (J. Appl. Chem. Russ., 1936, 9, 1505—1506).—A drop of the feebly alkaline solution is evaporated to dryness in a crucible, and a drop of 0.05% carmine in conc. H₂SO₄ is added; the colour changes from red to blue in presence of $\leq 10^{-7}$ g. of B.

R. T.

Mineral determination by microchemical methods. L. W. STAPLES (Amer. Min., 1936, 21, 613—634).—A summary of tests, involving the

recognition of cryst. ppts. under the microscope, which have given the most satisfactory results in mineral determination. New tests for Fe with NH₄Cl and for Al and Mn with NH₄ molybdate (cf. A., 1935, 720) are described.

L. S. T.

Electrometric titration of carbonic acid and sodium hydrogen carbonate in dilute solution. H. LIANDER (IVA, 1935, 78—83; Chem. Zentr., 1936, i, 1380).—*p_H* measurements in dil. aq. Na₂CO₃ and NaHCO₃ are compared with the titration curves for CO₂ and NaHCO₃ solutions. An expression is given for the variation with temp. of the equilibrium const.

J. S. A.

Qualitative analysis without use of hydrogen sulphide or sulphides. H. EICHLER (Oesterr. Chem.-Ztg., 1936, 39, 185—187).—Sn and Sb are removed as oxides by evaporation with HNO₃, and Hg, Ag, and Pb are pptd. with HCl. NH₄Cl and aq. NH₃ are added, pptg. Fe, Mn, Bi, and Hg, together with Al and Cr, which are separated by dissolving the ppt. in acid, and repptg. with NaOH + Br. The filtrate from the NH₃ pptn. is acidified and treated with NaOH, pptg. Ni, Co, Cu, and Cd, and leaving As, Zn, Ba, Sr, Ca, Mg, and Li in solution. In each of the groups so obtained, the metals may be identified by means of sp. tests.

J. S. A.

Potentiometric determination of potassium. I. TANANAEV and E. DJAPARIDZE (Z. anal. Chem., 1936, 107, 347—352).—Bivalent metals are titrated potentiometrically with Li₄Fe(CN)₆, alone and in presence of K, when the equivalence point is displaced owing to the formation of K₂M[Fe(CN)₆]. Using Mn (less suitably Cd or Ni), the [K] may be determined from the magnitude of the displacement, by reference to empirical curves.

J. S. A.

Application of picric acid in qualitative micro-analysis. A. F. ORLENKO and N. G. FESENKO (J. Appl. Chem. Russ., 1936, 9, 2116—2118).—Characteristic crystals are obtained with picric acid in presence of \leq the following min. amounts of the cations: K' 0.18, Na' 1.1, NH₄' 0.3, Mg'' and Ba'' 2.3, Sr'' 6.1, Ni'' 7.2, Pb'' 4.9, Zn'' 2.1, Hg'' 3, Ag' 2 $\times 10^{-6}$ σ .

R. T.

Application of organic redox systems to quantitative analysis. IV. Mechanism of reaction of silver salts with benzidine, and a sensitive new reaction for silver. L. M. KULBERG and S. B. SEREBRIANI (J. Gen. Chem. Russ., 1936, 6, 1335—1340).—The oxidation of benzidine (I) to benzidine-blue (II) in presence of Ag' proceeds as follows: Ag' + (I) + NO₃' \rightleftharpoons [Ag(NH₂-C₆H₄)₂]NO₃; 2Ag + O₂ \rightarrow Ag₂O₂; Ag₂O₂ + 2HNO₃ + 2H + 2(I) \rightarrow 2Ag + 2H₂O + (II), 2HNO₃. An analogous reaction with o-tolidine (III) serves for detection of Ag, as follows: 2—3 drops of HNO₃ are added to 0.1—0.5 ml. of the solution, which is heated to complete elimination of oxides of N, the residue is taken up in H₂O, and a drop of the extract is placed on a drop of 1% (III) in EtOH, when a blue spot appears in presence of $\leq 3 \times 10^{-8}$ g. of Ag.

R. T.

Detection and determination of zinc by means of diphenylthiocarbazone. H. FISCHER and G. LEOPOLDI (Z. anal. Chem., 1936, 107, 241—269).—

Ag, Cu, Hg, Au, Bi, Cd, and Pb interfere with the detection of Zn by means of diphenylthiocarbazone (I), but their reaction may be suppressed by adding an excess of $\text{Na}_2\text{S}_2\text{O}_3$ before extracting with a CCl_4 solution of (I). Interference due to Co, Ni, and Pd may be eliminated by adding KCN; Sn^{II} may be oxidised to Sn^{IV} . The colour produced by Zn with (I) is distinguished from that due to Co, Ni, and Pd in that it is decolorised by addition of $(\text{NH}_4)_2\text{S}$. By addition of $\text{Na}_2\text{S}_2\text{O}_3$ or KCN where necessary, traces of Zn (0.01—0.001%) may be determined in presence of all other elements, using the colorimetric, mixed colour, direct titration, or indirect titration methods employed in other (I) titrations. J. S. A.

Application of organic redox systems to quantitative analysis. III. Colorimetric determination of traces of copper. L. KULBERG and R. LIRTZMAN (J. Gen. Chem. Russ., 1936, 6, 1251—1255).—The substance is dissolved in acetate buffer at p_{H} 4, 3 ml. of 0.5% gelatin and 0.3 ml. of 1% *o*-tolidine are added to 10—25 ml. of the solution, which is then shaken, and 0.5 ml. of 30% NH_4CNS is added. The blue coloration obtained is compared with that given by standard CuSO_4 . The method serves for the determination of 0.005—0.02 mg. of Cu (error 1—10%) R. T.

Use of copper electrodes in electro-analysis. A. B. SCHACHKELDIAN and F. K. FISCHER (Abh. Staatsuniv. Saratov, 1936, [ii], Chem., 1, 83—91).—Pt cathodes may be replaced by Cu cathodes in the determination of Cu, Zn, Cd, and Ni. J. J. B.

Determination of small amounts of copper, tin, and cadmium in presence of large amounts of zinc, by electrolysis with a constant cathode potential. N. S. KRIVOLUTZKAJA (J. Appl. Chem. Russ., 1936, 9, 1520—1524).—The solution of ZnCl_2 is electrolysed at 40°, maintaining the cathode potential at 0.41 volt, to complete elimination of Cu from solution, when the cathode is washed, dried, and weighed. Electrolysis of the solution is continued at 0.71 volt (35 min.), the cathode is transferred to a solution of HCl and NH_2OH , and the current is passed during a further 30 min., at 0.78 volt. The cathode is then washed without interrupting the current, by siphoning. Cd is determined similarly in the residual solution, maintaining the cathode potential at 0.90 volt. R. T.

"Flouring" of mercury as end-point in potassium permanganate titration of impurities in mercury. H. P. MATTHEWS (Soc. Chem. Ind. Victoria, 1936, 36, 1104—1106).—Complete removal of dissolved metals from Hg corresponds with the attainment of max. surface tension, and therefore with the inception of the "flouring" effect. Hg, under 10% H_2SO_4 , is shaken with successive amounts of standard KMnO_4 until flouring occurs. J. S. A.

Gravimetric determination of aluminium. G. FLUMIANI and M. FERRICH (Rep. III Congr. Slav. Pharm., 1934, 160—169).—In order to avoid the high Al val. obtained from solutions containing Ba, Ca, Sr, and Mg, the Al solution was run slowly into a solution of NH_4NO_3 + slight excess of freshly distilled NH_3 at 80—90°, maintained at 60° for 20 min., the ppt.

being collected and washed with 400—400 c.c. of 0.2—0.3% NH_4NO_3 to remove the above metals. The filter and ppt. were dried, burnt together, and ignited at 1100—1200° for 10 min. Results are given for known solutions of pure AlCl_3 + Ba, Ca, and Mg chlorides. F. R.

Fractional reaction for Mn^{II} . N. A. TANANAEV (J. Appl. Chem. Russ., 1936, 9, 1495—1498, and Z. anal. Chem., 1936, 107, 343—347).—NaOH is added to the solution until it becomes turbid, when aq. KCN is added, in amount sufficient to dissolve the ppt. initially formed (Fe, Ni, Co, Zn, Mn, Hg, Ag, Cd, and Cu cyanides), leaving Al, Pb, and Sb hydroxides undissolved. Na_2O_2 is then added, and the solution is boiled, when $\text{Al}(\text{OH})_3$ and $\text{Pb}(\text{OH})_2$ dissolve, and a ppt. of MnO_2 forms in presence of <0.1 mg. of Mn. R. T.

Colorimetry of iron and its application to the analysis of phosphorites and apatites. A. B. SCHACHKELDIAN (Abh. Staatsuniv. Saratov, 1936, [ii], Chem., 1, 65—71).—If the solution contains, in addition to Fe, P_2O_5 or F which affect the colour of $\text{Fe}(\text{SCN})_3$, more $\text{Fe}(\text{SCN})_3$ is added to it, and the $[\text{Fe}^{\text{III}}]$ of the original solution is calc. according to Beer's law. The method was used in the analysis of phosphorites and apatites. J. J. B.

Stability of complex compounds of iron and method of detecting iron in a complex ion. A. B. SCHACHKELDIAN (Abh. Staatsuniv. Saratov, 1936, [ii], Chem., 1, 49—63).— $\text{K}_3\text{Fe}(\text{CN})_6$, CoSO_4 , and traces of Fe^{II} afford a bluish-green ppt. of $\text{FeCo}[\text{Fe}(\text{CN})_6]$ (I) which may be used for detecting Fe^{II} . Dissociation of $[\text{Fe}(\text{CN})_6]^{\text{IV}}$ and the presence of Fe^{II} in its solutions were proved by formation of (I) and by change of the colour and of the electrical conductivity of the solutions when boiled. J. J. B.

Determination of potassium ferrocyanide in presence of other salts. F. K. FISHER (Abh. Staatsuniv. Saratov, 1936, [ii], Chem., 1, 93—105).—The applicability of various methods is discussed. When large amounts of other salts are present, $[\text{Fe}(\text{CN})_6]^{\text{IV}}$ is pptd. by CuSO_4 , $\text{Cu}_2[\text{Fe}(\text{CN})_6]$ is dissolved in KOH, and $\text{K}_3\text{Fe}(\text{CN})_6$ thus regenerated is titrated with KMnO_4 . J. J. B.

Analysis of group II and III cations in presence of PO_4^{III} . M. SCHTSCHIGOL and N. DUBINSKI (J. Appl. Chem. Russ., 1936, 9, 1510—1513).— Na_2CO_3 and aq. NH_3 are added, when Fe^{III} , Al, Cr^{III} , Mn^{II} , Ca, Ba, Sr, and Mg carbonates, phosphates, and hydroxides are pptd., whilst Zn, Co, and Ni remain in solution as ammines. The ppt. is treated with AcOH to dissolve salts of Ca, Ba, and Sr. The three fractions thus obtained are further analysed by the ordinary procedures. R. T.

Detection of cobalt with furfuraldehyde in presence of thiocyanates. I. P. RIASANOV (Abh. Staatsuniv. Saratov, 1936, [ii], Chem., 1, 113—116).— $\text{Co}(\text{NO}_3)_2$ and furfuraldehyde in a saturated solution of NH_4CNS give a green colour perceptible in 16,000 parts of H_2O . Fe if present is pptd. by $\text{Na}_4\text{P}_2\text{O}_7$. Bi must not be present in large quantities. J. J. B.

Determination of very small quantities of uranium, and uranium content of sea-water. F. HERNEGGER and B. KARLIK (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 217—225; Chem. Zentr., 1936, i, 1666).— 10^{-10} g. of U may be detected by means of its fluorescence in NaF. The quant. application of the method is described. Sea- H_2O contains $0.36-2.3 \times 10^{-6}$ per g. of U per litre, according to its origin.

J. S. A.

Determination of polonium content from salts in thick layers. M. HOFFER (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 131—134; Chem. Zentr., 1936, i, 1566).—The Po content of active Pb salts has been determined. The half-val. period of Po is found to be 138 days.

J. S. A.

Analytical chemistry of tantalum, niobium, and their mineral associates. XXXIII. General summary and results. W. R. SCHÖELLER (Analyst, 1936, 61, 806—811).—The main results of the 32 papers published in 1921—1936 are summarised and discussed; a classified index to these papers is provided, and suggestions are made for the analysis of rare-earth minerals by the tartaric acid method.

J. G.

Stirring mechanism for precision thermostats. S. C. COLLINS (Rev. Sci. Instr., 1936, [ii], 7, 502).—A power-driven impeller maintains centrifugal motion and circulation of the liquid and leaves a max. of space for experimental apparatus.

N. M. B.

Humidity control device for ovens. C. T. WEBSTER (J. Sci. Instr., 1936, 13, 412—413).—Two bulbs, connected by a capillary tube containing Hg, operate on the principle of the wet and dry bulb thermometer, the Hg completing by its movement the heating circuit of a boiler. The difference of pressure between the two bulbs can be maintained at any desired val.

C. W. G.

Polarisation prisms. V. A. OSIPOV-KING (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 53—56).—The two calcite prisms of a double-image prism are joined by optical contact with a thin, plane-parallel, central plate of optical glass or fused quartz.

O. D. S.

Electron mirrors. G. HOTTENROTH (Z. Physik, 1936, 103, 460—462).—An apparatus employing a specularly reflecting potential field is described.

L. G. G.

Colorimetry during the period of development of colour. G. BERGAMI, E. BOERI, and P. BAER (Atti R. Accad. Lincei, 1936, [vi], 23, 610—616).—The colorimetry of solutions which obey Beer's law can be carried out during the period in which the colour is being developed if the reaction which is producing the colour is unimol. With reactions of higher order it is necessary to wait until the colour has been stabilised.

O. J. W.

Spectrograph with strong illumination. H. NAGAOKA (Proc. Imp. Acad. Tokyo, 1936, 12, 218—220).—The intensity of the light to be analysed by an all-quartz instrument is increased several fold by using a collimating system of two lenses, one of which is of short focal length and situated near the slit.

J. G. A. G.

Universal X-ray photogoniometer. R. B. HULL and V. HICKS (Rev. Sci. Instr., 1936, [ii], 7, 464—467).—A compact apparatus for making Laue, rotation, Schiebold-Sauter, and back-reflexion photograms is described.

N. M. B.

[Photo-electric] sedimentometer. J. MILBAUER (Sborn. Masary. Akad. Prace, 1935, 9, No. 7, 1—35; Chem. Zentr., 1936, i, 1267).—The transparency is measured with a photo-electric cell. Data for the effect of various factors on the sedimentation of $Al(OH)_3$ are recorded.

H. J. E.

High-speed motion-picture camera in study of surface tension. E. A. HAUSER, H. E. EDGERTON, B. M. HOLT, and J. T. COX, jun. (J. Physical Chem., 1936, 40, 973—988).—Drops of liquid falling from a circular orifice and films adhering to a circular ring have been photographed at the rate of 1200 and 600 pictures per sec. respectively. The experimental arrangement is described. The photographs show that a drop of liquid in the initial stages of falling remains attached to the main body by a thin neck, the length of which at the time of breaking increases, in the case of pure liquids, as the surface tension decreases. The presence in H_2O of capillary-active substances, however, diminishes the stem length. H_2O and glycerol produce stems which on breaking contract to a single secondary drop, whilst the stems of $PhNO_2$ and C_6H_6 undergo segmentation and finally yield three and from one to five secondary drops respectively. From the frequency of oscillation of the secondary drops satisfactory vals. for the surface tension can be calc. The complexity of the phenomena underlying the drop-wt. and ring methods of determining surface tension suggests that neither method is ideal from the point of view of the accurate measurement of surface tension.

F. L. U.

Determination of mean dispersity by means of the photo-cell. E. HOFFMANN (Kolloid-Z., 1936, 77, 286—288).—Technique is described.

E. S. H.

Application of electron lamps to determination of p_H by means of a glass electrode. V. BILININ (J. Appl. Chem. Russ., 1936, 9, 1560—1562).

R. T.

Lamp voltmeter. N. S. DROZDOV and M. K. GOLDBENKOV (J. Appl. Chem. Russ., 1936, 9, 1550—1554).

R. T.

Increased γ -ray sensitivity of tube counters and the measurement of the thorium content of ordinary materials. R. D. EVANS and R. A. MUGELE (Rev. Sci. Instr., 1936, [ii], 7, 441—449).—The theory and factors affecting sensitivity of tube counters are examined. Sensitivity can be increased by using screen-wire or grooved tube cathodes of greater effective area than the smooth, by the use of cathodes of high at. no., and by selecting the optimum operating voltage and pressure of the filling gas. In this way feeble γ -radiation from granitic rocks may be measured.

N. M. B.

Discrimination between partial and total coincidence counts with Geiger-Müller counters. J. C. MOUZON (Rev. Sci. Instr., 1936, [ii], 7, 467—470).—A simple discriminating amplifier, using single

pentodes but eliminating the negative bias on the control grids of the amplifier tubes, is described.

N. M. B.

Wilson cloud machines for portable use. G. L. LOCHER (Rev. Sci. Instr., 1936, [ii], 7, 471—478).—Two new forms of instrument suitable for portable uses, and with arrangement for optional control by Geiger-Müller counters, are described.

N. M. B.

Thyratron-controlled ionisation gauge. J. B. HOAG and N. M. SMITH, jun. (Rev. Sci. Instr., 1936, [ii], 7, 497—499).—A thyratron maintains a constant ionising electron current with line voltage fluctuations of $\pm 6\%$. The circuit operates by a.c., and provision is made for outgassing the metal parts of the gauge.

N. M. B.

Apparatus for investigating absorption of electric waves on passage through matter. G. PETRUCCI (Nuovo Cim., 1935, [ii], 12, 361—367; Chem. Zentr., 1936, i, 1461).—Apparatus is described.

J. S. A.

Heavy-current discharge tube. A. HUNTER and R. W. B. PEARSE (J. Sci. Instr., 1936, 13, 403—407).—A H_2O -cooled cold-cathode 3-kw. discharge tube is described. It is suitable for use with many gases, particularly H_2 , and has the advantages of simplicity, robustness, portability, and constancy of intensity.

C. W. G.

Technique of electro-osmotic measurements. A. VAŠIČEK (Kolloid-Z., 1936, 77, 305—310).—Apparatus and technique are described.

E. S. H.

Electromagnetic piston pump. W. BRENSCH-EDÉ (Z. physikal. Chem., 1936, 178, 74—75).—A double-acting pump, an improved form of that devised by Livingstone (A., 1929, 903), is described. It is capable of working against pressures up to >100 mm.

R. C.

Photo-electric method for recording fast chemical reactions and its application to the study of catalyst-substrate compounds. K. G. STERN and D. DuBOIS (J. Biol. Chem., 1936, 116, 575—586).—A beam of light, of λ selected by a monochromator, traverses the reaction vessel, and falls on a photo-electric cell; the current from this, after amplification, actuates a string galvanometer, the deflexions of which are recorded on sensitised paper film. Rapid and transitory changes in light absorption, resulting from injection of reagent solution into the reaction vessel, are thus recorded. Methæmoglobin and EtO_2H form an unstable intermediate compound; the formation is half complete in 0.06—0.26 sec., under various conditions. Some preliminary data relating to the liver catalase- EtO_2H reaction are given.

F. A. A.

Vertical micro-electrophoresis cell with non-polarisable electrodes. H. A. ABRAMSON, L. S. MOYER, and A. VOET (J. Amer. Chem. Soc., 1936, 58, 2362—2364).—Apparatus and technique are described and results for different suspensions reported.

E. S. H.

Potentiometry using several electrode pairs connected in series. L. WOLF (Z. anal. Chem., 1936, 107, 338—342).—An assembly is described of four Cu-Ag electrode pairs in the form of a stirrer, so

arranged that on removal from the liquid (e.g., during potentiometric titrations), they dip in small, mutually insulated portions of liquid, thereby giving a multiplied e.m.f.

J. S. A.

Illuminated matt screen for titration. S. M. STREPKOV (J. Appl. Chem. Russ., 1936, 9, 1427).—Apparatus is described.

R. T.

Design and manipulation of the Lunge nitrometer. R. E. SUMMERS and W. H. SUMMERS (Soc. Chem. Ind. Victoria, 1936, 36, 1108—1113).—A modified design is described.

J. S. A.

Automatic registration of amount and velocity of sorption. K. V. TSCHMUTOV and V. S. FROLOV (J. Appl. Chem. Russ., 1936, 9, 1555—1559).

R. T.

Pyknometer. F. G. HOFFMANN (Chem.-Ztg., 1936, 60, 1037).—A 10-c.c. beaker-shaped vessel has an accurately fitting flat cover through the centre of which passes a thermometer. A smaller, similar type (1 c.c.) without thermometer is also described.

E. H. S.

Capillary analysis at constant temperature and humidity. C. A. ROJAHN (Arch. Pharm., 1936, 274, 545—547).—An apparatus is described.

R. S. C.

Two practical laboratory hints. K. LUBER (Chem.-Ztg., 1936, 60, 1006).—(1) For extraction with liquids of low b.p., a Soxhlet extractor, made from a test-tube and glass tubing, is placed inside an ordinary adaptor, connected to a flask and reflux condenser. (2) Small quantities of liquid are cooled in a test-tube covered with cotton-wool, on to which Et_2O is dropped.

E. A. F.

Concrete bases for retort stands. O. H. F. PIERIS (J. Sci. Instr., 1936, 13, 417—418).—Satisfactory bases of any desired shape can be cast.

C. W. G.

Stop-cocks for mechanical operation. C. F. WINCHESTER (Science, 1936, 84, 443—444).

L. S. T.

Modification of Rast's micro-method for mol. wt. determination. Y. P. LIU and T. P. CHOU (J. Chinese Chem. Soc., 1936, 4, 422—428).—Greater accuracy is claimed if a glass stem 2.5 cm. in length and 2 mm. in diameter, at the end of which is a bulb 8 mm. in diameter, is substituted for the usual m.p. tube.

C. R. H.

Stopcock substitute. W. C. SCHUMB and H. I. CRANE (J. Amer. Chem. Soc., 1936, 58, 2649).—The tube can be sealed by Hg supported by a fritted glass plate.

E. S. H.

Spinning-top ultracentrifuge and the sedimentation of small molecules. J. W. WILLIAMS and C. C. WATSON (J. Amer. Chem. Soc., 1936, 58, 2650—2651).—A criticism of published work (cf. A., 1935, 724).

E. S. H.

[Spinning-top ultracentrifuge and the sedimentation of small molecules.] J. W. McBAIRN (J. Amer. Chem. Soc., 1936, 58, 2652).—A reply to criticism (cf. preceding abstract).

E. S. H.

Centrifuging in rotating hollow cylinders. E. A. HAUSER and C. E. REED (Nature, 1936, 138, 975; cf. A., 1936, 1355).—The method outlined

enables data for the calculation of the particle size distribution curve in a polydisperse system or a particle size fractionation to be obtained. L. S. T.

Micro-viscosimeter for non-Newtonian liquids. G. W. S. BLAIR (Kolloid-Z., 1937, 78, 19—21).—A capillary instrument of 0.5 c.c. capacity is described.

Polygonal presentation of polyphase phenomena. A. H. HUTCHINSON (Trans. Roy. Soc. Canada, 1936, [iii], 30, V, 19—26).—Data which in-

volve three or more variable factors, conditions, or characters can be represented graphically by the use of polygons. The principles underlying the construction of such graphs are described, and examples of polygonal graphs are given. J. N. A.

Demonstration of phosphorescence. H. WARREN (Nature, 1936, 138, 974).—A lecture experiment. L. S. T.

Lecture experiment on electro-capillarity. A. THIEL (Z. Elektrochem., 1936, 42, 879—880). E. S. H.

Geochemistry.

Radioactivity of mountain air. H. GARRIGUE (Ann. Physique, 1936, [xi], 6, 751—825).—A detailed account of investigations previously reported (cf. A., 1935, 468). The snow-covered mountain-top air may contain a max. of 10^{-9} curie of Rn per litre, and the liberation to the atm. may reach, on the Pic-du-Midi, the val. of the Rn produced by the snow-capped summit of the mountain (100 g. Ra). N. M. B.

[Radioactive contents of air at Badgastéin.] W. KOSMATH and O. GERKE (Sitzungsber. Akad. Wiss. Wien, 1935, IIa, 144, 339—355; Chem. Zentr., 1936, i, 1200).—Data for the Rn content of the air in various localities are recorded. H. J. E.

Determination of the sodium chloride content of air. H. P. GODARD and W. F. SEYER (Trans. Roy. Soc. Canada, 1936, [iii], 30, III, 85—88).—The NaCl content of the air in the neighbourhood of Vancouver has been determined under varying meteorological conditions. O. D. S.

Upper air. J. KNIGHT (Proc. Roy. Phil. Soc. Glasgow, 1936, 62, 30—46).—An account of the methods and results of observation recording in the upper air and a summary of contemporary knowledge. N. M. B.

Field of thermal water. B. N. FORSCH (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 185—186).—On the assumption that thermal H_2O is saturated with $CaCO_3$ at a certain stage in its metamorphosis, the expression $ah - 2 \times 10^4 (C_R L / N_2 K_2) \sim \text{const.}$, is derived (a = alkalinity, h = hardness of the H_2O ; L = solubility product and N_2 = normality of $CaCO_3$; K_2 = second dissociation const. of H_2CO_3). This yields a family of hyperbolæ, in agreement with the data from 25 springs in the Baikal region, in which the limits for ah are 500 and 50 (mean 160). R. C. M.

Granitisation in the Cross Lake region, Manitoba. H. C. HORWOOD (Trans. Roy. Soc. Canada, 1936, [iii], 30, IV, 99—117).—At contact with intruded granite, andesite shows a gradual transition into granodiorite-gneiss and arkose into granite-gneiss. In the andesite there is a gain of quartz, K-felspar, and biotite, and loss of hornblende; in the arkose K-felspar replaces quartz. The chemical compositions of the rocks (calc. from micrometric analysis of the minerals in thin sections) show in the andesite gain of SiO_2 and K_2O , and loss of Fe_2O_3 , FeO , MgO ; and in the arkose gain of Al_2O_3 and K_2O with loss of SiO_2 . These changes were effected by aq. alkaline solutions

containing SiO_2 , Al_2O_3 , and K_2O emanating from the granite at about 600° . L. J. S.

Sudbury nickel irruptive. III. Environment. W. H. COLLINS (Trans. Roy. Soc. Canada, 1936, [iii], 30, IV, 29—53; cf. A., 1935, 602).—A discussion of the relative ages of the "younger granites" (in which some of the ore occurs) and the norite. Further chemical analyses are given of rocks, and ages are computed from the Ra-He ratio. L. J. S.

Knebelite from Bluebell mine, Kootenay Lake, B.C. H. C. GUNNING (Trans. Roy. Soc. Canada, 1936, [iii], 30, IV, 19—22).—Dark green to black patches of knebelite occur in Fe Mn carbonate with pyrrhotine, galena, etc., in limestone intruded by granite. Analysis gave SiO_2 28.93, Al_2O_3 nil, Fe_2O_3 4.06, FeO 39.15, MnO 24.82, MgO 0.05, CaO 0.68, $H_2O + 2.01$, $H_2O - 0.10 = 99.80\%$, corresponding with $(Fe, Mn)_2SiO_4$. L. J. S.

High-temperature research on silicates and its significance in igneous geology. N. L. BOWEN (Amer. J. Sci., 1937, [v], 33, 1—21).—A study of the several systems involving SiO_2 , Al_2O_3 , FeO , CaO , MgO , Na_2O , and K_2O shows that with fractional crystallisation the residue consists of alkali Al silicate, $NaAlSi_3O_8$ — $KAlSi_3O_8$ — SiO_2 , which is referred to as "petrogeny's 'residual' system." Plots of analyses of phonolites, trachytes, and rhyolites from the East African Rift Valley fall within this area. It is suggested that these rocks represent the residual liquids of crystallising magmas. L. J. S.

Monoclinic "hypersthene" from the Cascade lavas. J. VERHOOGEN (Amer. J. Sci., 1937, [v], 33, 63—69).—Optical data are given for pyroxenes in andesites and dacites from the Cascade Range in Oregon and Washington. These include hypersthene, diopsidic augite, pigeonite, and a monoclinic "hypersthene." The last has the appearance and pleochroism of hypersthene, but gives oblique optical extinction and optical data different from those of clinohypersthene. The approx. chemical composition of this mineral is deduced from the analysis of the containing rock. L. J. S.

Symplectite-bearing nodules in the Ardour marble, Argyllshire. H. I. DREVER (Geol. Mag., 1936, 73, 448—468). L. S. T.

Shearing phenomena at high pressure of possible importance for geology. P. W. BRIDG-

MAN (J. Geol., 1936, **44**, 653—669; cf. A., 1936, 146).—Various phenomena of plastic flow have been studied at confining pressures up to 50,000 kg. per sq. cm. Chalcocite is changed throughout its mass to ordinary cubic Cu_2S ; quartz glass and calcite become more dense, the changes being probably confined to a thin surface layer. Bi_2O_3 is reduced to Bi at the surface and SnO_2 to SnO . Metallic Cu + S is converted into a mixture of chalcocite and cubic Cu_2S . L. S. T.

Colour changes in zircon (hyacinthe) on heating. K. CHUDOBÁ (Deuts. Goldschmiede-Ztg., 1935, **38**, 474—475; Chem. Zentr., 1936, i, 1199; cf. A., 1936, 1087).—Mongka zircons which have been discoloured by sunlight become red on heating to 110° . This colour disappears on re-exposure to sunlight. Above 110° a brown colour develops and at a higher temp. the specimen becomes colourless and cannot be coloured by subsequent treatment. H. J. E.

Spectrographic examination of Siamese zircons. T. G. KENNARD and D. H. HOWELL (Amer. Min., 1936, **21**, 721—726).—Brown, blue, and colourless Siamese zircons from Annam, French Indo-China, show in inclusion-free samples no difference in chemical composition, except for traces of Mg, Na, and Ag. Small amounts of Hf, and traces of Ba and Ca, occur in all the inclusion-free samples, and small amounts or traces of Ag, Mg, or Na were found in one or more specimens. The black inclusions and red spots are markedly different in chemical composition from the inclusion-free material, being much richer in Fe. Al, Cu, and Ti were sometimes present. The blue and brown colours in the inclusion-free zircons are not pigmental. L. S. T.

Outgrowths on zircon. J. A. BUTTERFIELD (Geol. Mag., 1936, **73**, 511—516).—Outgrowths in the form of small zircon pyramids growing out from the parent zircons are described. L. S. T.

Osmiridium. IV. O. E. ZVJAGINTZEV (Ann. Sect. Platine, 1936, **13**, 123—127).—Native osmiridium from the N. Caucasus and other regions is described (cf. A., 1935, 440). R. T.

Radioactivity of minerals. S. GRABIANKA (Rocz. Chem., 1936, **16**, 436—443).—Radioactivity data are recorded for red and black leptinites from Sabeau (France). R. T.

Lead-uranium ratio of Henvey cyrtolite. O. B. MUENCH (J. Amer. Chem. Soc., 1936, **58**, 2433—2434).—An abnormally low ratio was found. E. S. H.

Spilitic rocks in New Zealand [Great King Island]. J. A. BARTRUM (Geol. Mag., 1936, **73**, 414—423).—Analyses are recorded. L. S. T.

Evolution of the Lower Archæan rocks in Central Sweden and their iron, manganese, and sulphide ores. N. H. MAGNUSSON (Quart. J. Geol. Soc., 1936, **92**, 332—359).—The various types of ore are described, and modern views concerning their origin, metamorphism, and relationships to the enclosing rocks are summarised. L. S. T.

Peculiar hydrothermal copper-bearing veins of the N.E. Colorado plateau. R. P. FISCHER

(Econ. Geol., 1936, **31**, 571—599).—In the Cashin, Cliffdweller, Sunrise, Copper Rivet, and Hoosier (Salt Valley, Utah) mines the ore consists mainly of Cu sulphides, with dolomite, calcite, and barite as the gangue minerals. The deposits are probably of hydrothermal origin, with colloids playing an important rôle in the formation of the ores. Oxidation is negligible in the first two, but abundant in the last three mines. L. S. T.

Hypogene anhydrite from McIntyre mine, Porcupine District, Ontario. G. B. LANGFORD and E. G. HANCOX (Econ. Geol., 1936, **31**, 600—609). L. S. T.

Occurrence of minute quantities of mercury in the Chinle shales at Lees Ferry, Arizona. C. LAUSEN (Econ. Geol., 1936, **31**, 610—617).—The shales contain from 0.001 to 0.008% Hg (approx.). L. S. T.

Livingstonite. W. E. RICHMOND (Amer. Min., 1936, **21**, 719—720).—Livingstonite from Huitzucó, Guerrero, Mexico, is monoclinic, prismatic with $a:b:c$ 3.7572:1:5.3660, β $104^\circ 10'$; space-group $-P2_1/c$, cell-content (provisional) $\text{Hg}_4\text{Sb}_{16}\text{S}_{28}$. L. S. T.

Petrologic results of a study of the minerals from the tertiary volcanic rocks of the San Juan region, Colorado. E. S. LARSEN, J. IRVING, F. A. GONYER, and E. S. LARSEN 3rd (Amer. Min., 1936, **21**, 679—701).—The occurrence and conditions of formation of quartz, tridymite, and cristobalite are described. Analyses and optical properties of pyroxenes and olivine from the San Juan lavas are recorded and discussed. L. S. T.

X-Ray determination of the silica minerals in submicroscopic intergrowths. C. S. HURLBUT, jun. (Amer. Min., 1936, **21**, 727—730).—A method for identifying cristobalite, tridymite, and quartz is outlined. L. S. T.

Geology of the silver deposit at Colquijirca, Peru. H. E. MCKINSTRY (Econ. Geol., 1936, **31**, 618—635; cf. A., 1935, 1101).—The ore bodies resulted from the replacement of beds in a folded Tertiary (?) shale-limestone formation. Mineralising solutions entered the limestone along the bedding at a stage later than the folding, silicified and kaolinised the beds, and deposited sulphides. The solutions were high in SO_4^{--} and were probably acid at certain stages. Comparison of analyses of the overlying gossan and sulphide ore show that oxidation processes were normal, but Ba is leached whereas Zn is retained in the gossan, which also has a ratio of $\text{Fe}:\text{Si} >$ in the ore. Impervious strata, by preventing dissipation of the descending Ag-bearing waters, may be partly responsible for the exceptional richness of the secondary ore. The ores have been markedly enriched by supergene native Ag. The stromeyerite may also be supergene (cf. *loc. cit.*). L. S. T.

Diopsides from Southern California. R. MERRIAM and J. D. LAUDERMILK (Amer. Min., 1936, **21**, 715—718).—Chemical analyses and optical properties agree with vals. for artificial diopside. Spectrographic analysis shows the presence of small amounts or traces of Fe, Al, Mn, Cu, Ti, etc. L. S. T.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

MARCH, 1937.

Nuclear spin and magnetic moment of ${}^6\text{Li}$. J. H. MANLEY and S. MILLMAN (Physical Rev., 1937, [ii], 51, 19—21; cf. A., 1936, 1175).—A detailed account of results previously reported. N. M. B.

Helium I like spectra. H. A. ROBINSON (Physical Rev., 1937, [ii], 51, 14—18).—Using a new Siegbahn grazing-incidence spectrograph for the region $<100\text{ \AA}$., measurements of the $1s^2.1S_0-1s.np^1P_1$ series of the He I isoelectronic sequence for Be III, B IV, and C V, with available data for He I, Li II, N VI, and O VII, are examined critically and vals. for the $1s^2.1S_0$ terms are obtained. Corr. calc. vals. are in good agreement with experiment. N. M. B.

Lines of neutral oxygen and carbon in the spectra of novæ. D. B. McLAUGHLIN (Astrophys. J., 1936, 84, 104—110).—Absorption lines of O I and C I are common in the spectra of novæ in their early stages. L. S. T.

Carbon arc in vacuum. F. H. NEWMAN (Phil. Mag., 1937, [vii], 23, 181—186).—Low-voltage arcs between cold graphite electrodes in gases at very low pressure could be started by a momentary high-voltage discharge in the gas. The starting of the arc is attributed to a surge of positive ions to form a space-charge at the cathode. Spectra of the arc immediately after striking are due to the gas in the tube. A. J. E. W.

Active nitrogen. J. KAPLAN (Nature, 1937, 139, 115).—Cario and Stille's failure to obtain certain N bands (A., 1936, 1309) is due to incomplete purification of the N_2 in their discharge tubes. L. S. T.

Fluorescence of N_2 and N_2^+ . A. JAKOVLEVA (Physikal. Z. Sovietunion, 1936, 9, 547—548).—Bands of the second positive group of N_2 and some bands of the N_2^+ ion between 3500 and 5000 \AA . were observed when N_2 , air, NO, and C_2N_2 were illuminated through a fluorite window by light from a H_2 tube. The fluorescence spectrum is similar to that described by Oldenburg (A., 1926, 992). O. D. S.

Absorption spectrum of oxygen. A. PRICHOTKO (Physikal. Z. Sovietunion, Spec. no., June, 1936, 22—38).—The absorption spectra of solid α -, β -, and γ - O_2 comprise five similar series in the infra-red, visible, and near ultra-violet regions, and an ultra-violet band of different characteristics, and coincide closely with the bands of liquid O_2 . Hence the first and second series are due to the $\rightarrow^1\Delta_g$ and ${}^3\Sigma_g^- \rightarrow {}^3\Sigma_g^+$ transitions, respectively. The fine structure of the bands is probably due to vibrations in the O_2 lattice. J. W. S.

Isotope displacement in the neon spectrum. R. RITSCHL and H. SCHÖBER (Physikal. Z., 1937, 38, 6—9).—The isotope displacement in the Ne spectrum increases with the term val., being 0 for the $8s_s$ term, and $118 \times 10^{-3} \text{ cm}^{-1}$ for the $1s_s$ term ($38,040 \text{ cm}^{-1}$). A. J. M.

Spectroscopic study of the constitution of sulphur vapour. B. ROSEN and (MLLE.) N. MORGULEFF (Compt. rend., 1936, 203, 1349—1351).—The effect of temp. (500° , 1000°) and pressure on the S absorption bands at $\lambda\lambda$ 3600—4600 \AA . is different from that on the S_2 bands at $\lambda\lambda$ 3200—3500 \AA . The former probably consist of part of the S_2 system with a superposed continuum. The temp. and pressure dependence of the intensity of the continuum is approx. the same as the dependence of the $[\text{S}_2]$ on these factors (cf. A., 1910, ii, 118). H. J. E.

Pressure broadening of the potassium resonance lines by argon and nitrogen. G. F. HULL, jun. (Physical Rev., 1936, [ii], 50, 1148—1150; cf. Margenau, A., 1936, 3).—Broadening for 1—40 atm. was investigated. Half-widths and shifts plotted against "relative density" (r.d.) give straight lines up to about r.d. 14, indicating predominance of Lorentz type broadening in this region, but thereafter the curves depart from linearity. Theoretical contours are in satisfactory agreement with experiment. The const. b (measure of Van der Waals forces), calc. by three independent methods, is 24×10^{-32} and $18 \times 10^{-32} \text{ cm}^6 \text{ sec}^{-1}$ for A and N_2 , respectively. N. M. B.

Electric explosion spectrum of metals. T. FUTAGAMI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 1—29).—The spectra of wires of Cu, Ag, Mg, Ca, Zn, Cd, Hg, Al, Tl, Sn, and Pb exploded electrically have been photographed, and show the presence of arc and spark lines. Pressures and temp. generated in the explosion are of the order of 30 atm. and 9000° abs. , respectively. R. S. B.

Production of white light by electrical luminescence of gases. M. LAPORTE (Compt. rend., 1936, 203, 1341—1342).—A condensed discharge through Xe, with a discharge frequency of 50—100 per sec. controlled by a thyatron, gave a white light. H. J. E.

Analysis of the spectrum of singly-ionised samarium. W. ALBERTSON (Astrophys. J., 1936, 84, 26—72).—Tables of classified lines and of the energies, excitation potentials, and experimental g vals. of the terms are given. The ionisation potential of Sm II is approx. 11.4 volts. The close relation between Sm II and Eu II is shown, and the

types of rare-earth spectra and normal electron configurations are discussed. 88 lines of Sm II have been identified in the spectrum of the sun. L. S. T.

Field strength along the positive column in mercury vapour with very small current densities. G. MIERDEL and W. SCHMALENBERG (Wiss. Veroff. Siemens-Werken, 1936, 15, No. 3, 60—74).—Measurements were made on the positive column of the glow discharge in Hg vapour between 0.76 and 17 mm. Hg, with c.d. down to 10^{-6} amp. per sq. cm., and various electrode distances. A. E. M.

Absorption in the mercury discharge. V. FABRIKANT (Physikal. Z. Sovietunion, 1936, 9, 259—263).—The work of the author and Pulver on the absorption of the Hg lines in the Hg discharge (cf. A., 1934, 1280) is discussed in the light of the observations of Elenbaas (cf. A., 1935, 272). R. S. B.

Optical investigation of discharge in metallic vapours. II. Reabsorption of light in the mercury discharge. V. FABRIKANT [with F. BUTAEVA] (Physikal. Z. Sovietunion, 1936, 9, 383—404).—The hypothesis that reabsorption can only affect the intensity ratios of Hg lines having a common higher energy level is discussed. It is shown that reabsorption accounts qualitatively for all observed intensity ratios. Results agree with the thermal theory of the Hg discharge at high pressures. H. C. G.

Spectroscope and the atom. A. FOWLER (Nature, 1937, 139, 95—98).—A lecture. L. S. T.

Multiplet strengths for transitions involving equivalent electrons. D. H. MENZEL and L. GOLDBERG (Astrophys. J., 1936, 84, 1—10).—The parentages of terms arising from shells of equiv. electrons are tabulated. L. S. T.

Absolute multiplet strengths. L. GOLDBERG (Astrophys. J., 1936, 84, 11—13).—Factors by means of which the relative multiplet strengths previously given (*ibid.*, 1935, 82, 1) can be converted into abs. strengths are tabulated. L. S. T.

Term splitting of the hydrogen atom in high electric fields. G. GUREVITSCH (Physikal. Z. Sovietunion, 1936, 9, 563—579; cf. A., 1931, 4).—Mathematical. O. D. S.

Intensities of forbidden transitions. M. BRONSTEIN (Physikal. Z. Sovietunion, 1936, 9, 542—545).—Mathematical. O. D. S.

Spectrum of the discharge of high-tension generators in air. J. JAFFRAY (Compt. rend., 1936, 203, 1347—1349).—The principal features of the discharge in air at 1 atm. are recorded. H. J. E.

Sparking potentials at ultra-high frequencies. J. THOMSON (Phil. Mag., 1937, [vii], 23, 1—24).—The variation with gas pressure (p) and frequency (ν) of sparking potentials (V_s) between parallel-plate electrodes in H₂ was investigated for ν vals. between 1 and 100 megacycles per sec. The V_s - p curves are straight lines when ν is high, but develop two minima successively as ν decreases. A theory of the discharge is developed. A. J. E. W.

Importance of collisions of the second kind in the glow of mixtures of sodium and mercury

vapours. A. FERCHMIN and S. FRISCH (Physikal. Z. Sovietunion, 1936, 9, 466—476).—An increase in intensity of Na lines in a glow discharge was observed on the addition of Hg for those lines having excitation potentials within 0.02—0.04 volt of the excitation potential of the 3P_0 and 3P_1 levels of Hg. O. D. S.

Role of collisions of the second kind in the luminescence of vapour mixtures Na-Mg, Na-Zn, and Na-Cd. V. KONOVALOV and S. FRISCH (Physikal. Z. Sovietunion, 1936, 10, 111—114).—Light from vapours of the mixed metals in a discharge tube has been studied spectroscopically, and excitation potentials have been calc. Collisions of the second kind occur, with a probability which decreases rapidly with increase in p.d. between the levels $3p^2P$ - $5s^2S$ of Na and 3P_2 of Zn, Cd, and Mg, and then remains approx. const. R. S. B.

Rôle of collisions of the second type in gaseous discharges. S. E. FRISCH (Bull. Acad. Sci. U.R.S.S., 1936, 431—440).—The rôle of collisions of the second type in luminescence of Na-Hg, -Mg, -Cd, and -Zn vapour (tubular cathode) has been investigated. The intensity of the Na λ 4423 doublet is increased 550-fold in presence of Hg, and that of the λ 6156 doublet 2-, 6.1-, and 44-fold in presence of Mg, Cd, and Zn vapours, respectively. R. T.

Discharge radiation in vapours of metals. V. A. FABRIKANT (Bull. Acad. Sci. U.R.S.S., 1936, 441—462).—The pressure-intensity radiation curves for discharges through Hg, Cd, and Zn vapours are of the same general type, and exhibit minima, the depth of which varies as the thermal conductivity of the vapours; the minima become less marked in presence of inert gases. The curves are interpreted on the basis of reabsorption, and of variations in the no. of collisions between atoms and electrons and in the efficiency of these collisions. R. T.

Electrodeless discharge. A. KRASSIN (Physikal. Z. Sovietunion, 1936, 9, 449—460). O. D. S.

Rôle of positive ions in the initiation of a gaseous discharge. M. STEENBECK (Wiss. Veroff. Siemens-Werken, 1936, 15, No. 3, 32—41).—The mechanism by which discharge commences in lamps containing metallic vapours or rare gases is discussed mathematically in relation to the field distortion caused by positive ions, and to the electron temp. and the no. of ions per unit vol. necessary to start the discharge. H. C. G.

Proof of the carrier laws for the mercury-vapour rectifier. A. VON ENGEL and M. STEENBECK (Wiss. Veroff. Siemens-Werken, 1936, 15, No. 3, 42—59).—Measurements of the axial electron concn., field strength, and temp. and pressure in and out of the discharge were made in a Hg rectifying lamp over ranges of pressure and c.d. Results are discussed in relation to the theory of the discharge (see preceding abstract). H. C. G.

Electric discharge through open capillary tube. H. TAKÔ (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 30—41).—The spectrum of the discharge and the eroding effect on the walls have

been studied with an open capillary connected to a vac. pump. R. S. B.

Mechanism of the static spark discharge. L. B. LOEB (Rev. Mod. Physics, 1936, 8, 267—293).—A review. There is no single secondary process of universal occurrence in discharge phenomena.

A. J. M.

New dark space near the cathode glow in an arc discharge. M. J. DRUYVESTEYN and N. WARMOLTZ (Physica, 1937, 4, 51—68).—A new dark space around the oxide-coated cathode of an arc in the rare gases and Hg vapour is found at c.d. >0.1 amp. per sq. cm. and 10^2 —3 mm. pressure; its thickness is about 20 times that of the space-charge sheath at the cathode. At lower pressure it disappears and a bright sheath of the same dimensions is seen. Coming from the cathode, the fast electrons increase sharply in concn. and decrease in mean energy at the limit of the sheath. The electrical behaviour is explained by the scattering, increasing with arc current, of the group of fast electrons starting at the boundary of the space-charge layer on the cathode.

N. M. B.

Heat production in the positive column of discharges in monatomic gases. K. SOMMERMEYER (Ann. Physik, 1937, [v], 28, 240—244; cf. A., 1932, 551).—The heat production in the positive column of discharges in the rare gases and of the Hg high-pressure discharge can be accounted for by energy exchange on collision between electrons and neutral gas atoms.

O. D. S.

Fraunhofer's spectrum in the interval from 77,000 to 110,000 Å. A. ADEL and V. M. SLIPHER (Astrophys. J., 1936, 84, 354—358).—Recent observations of 100 fine structure lines in the solar grating spectrum are described (cf. A., 1935, 806).

L. S. T.

Variations of the spectrum of γ Cassiopeiae. D. CHALONGE and H. SAFIR (Compt. rend., 1936, 203, 1329—1332).—Data are recorded.

H. J. E.

Spectra line intensities in O- and B-type stars. P. RUDNICK (Astrophys. J., 1936, 83, 439—475).—The behaviour of lines of H, He I, He II, Si II, Si III, Si IV, N II, N III, C II, and Mg II is described.

L. S. T.

Spectrum of the solar corona in 1936. Wavelengths and intensities. B. LYOT (Compt. rend., 1936, 203, 1327—1329).

H. J. E.

Density of calcium and hydrogen at different levels in the sun. T. ROYDS and A. L. NARAYAN (Current Sci., 1936, 5, 294—295).—The change in the contour of some prominent solar lines, studied photometrically, is a combination of the opposing effects of an increase in the no. of absorbing atoms due to increased length of atm. path with inclination to the vertical, and a decrease in the no. of absorbing atoms as the effective level of the photosphere becomes higher. From contour change measurements estimates of the no. of atoms per c.c. at different levels over 0—600 km. are tabulated.

N. M. B.

Influence of temperature on the fine structure of the X-ray K absorption edge of iron. W. SJOERDSMA (Physica, 1937, 4, 29—32).—The changes

in the fine structure of the X-ray K absorption edge of Fe, investigated up to 830°, are in agreement with Kronig's theory.

N. M. B.

Fine structure of the K absorption edges of copper at low temperatures. H. SWEDENBORG and M. CLAESON (Ann. Physik, 1937, [v], 28, 159—168).—In agreement with the theory of Kronig (A., 1931, 993; 1932, 553), it is found that the fine structure of the K absorption edges of Cu is more definite at low temp. than at room temp., and that it extends further towards the short-wave side. At -190° the intensity of the lines for Cu is about 50% $>$ at 20° .

A. J. M.

X-Ray scattering coefficients of gases. Y. H. WOO and C. P. SUN (Sci. Rep. Tsing Hua Univ., 1936, 3, 549—553).—Scattering coeffs. are calc. for O₂ from 0.4—1.5 Å., and for Ne and Ar from 0.098—1.540 Å. Vals. are in agreement with experiment.

O. D. S.

Thermionic emission of platinum. L. V. WHITNEY (Physical Rev., 1936, [ii], 50, 1154—1157).—In view of divergent data, thermionic emission from round filaments and flat strips after rigorous high vac. and heat-treatment near 2000° abs. was measured. The vals. 5.32 volts for the work function and 32 amp./cm.² deg.² for the const. A were found.

N. M. B.

Thermionic emission from barium-coated tungsten. L. N. DOBRETZOV and G. A. MOROZOV (Physikal. Z. Sovietunion, 1936, 9, 352—361).—A W filament was found to be free from Ba at temp. $>1800^\circ$ abs. At lower temp. the W became coated with Ba and the electron current increased. The rate of evaporation of the Ba was measured at different temp. The heat of evaporation of Ba atoms is $151,000 \pm 10,000$ g.-cal. per mol.

A. E. M.

Absolute photo-electric yields of Mg, Be, and Na. M. M. MANN, jun., and L. A. DU BRIDGE (Physical Rev., 1937, [ii], 51, 120—124).—Vals. measured for the work function of distilled surfaces were Mg 3.68, Be, 3.92, and Na 2.29 volts. The corresponding vals. of α in Fowler's photo-electric equation are 3.2, 25, and 180×10^{-34} .

N. M. B.

Photo-electric effect of the deuteron. G. BREIT, J. R. STEEN, and E. U. CONDON (Physical Rev., 1937, [ii], 51, 56; cf. A., 1936, 1041).—Calculations and graphs are corr.

N. M. B.

Electron emission of an oxide-coated cathode in an arc discharge. M. J. DRUYVESTEYN and N. WARMOLTZ (Physica, 1937, 4, 41—50).—The emission is determined by measuring arc voltage as a function of arc current. Results can be explained on the hypothesis that an accelerating electric field for the electrons does not appear at the same arc current for all parts of the rough oxide surface.

N. M. B.

Velocity distribution of electrons in an electric field. II. B. DAVIDOV (Physikal. Z. Sovietunion, 1936, 9, 433—448; cf. A., 1936, 4).—Theoretical. The equations previously deduced are generalised to include the case in which the mean free path of the electron moving in a gas depends on its velocity. The order of magnitude of the exchange forces between the electrons is estimated.

O. D. S.

Interaction with matter of high-energy particles, electrons from various sources, and cosmic-ray particles. L. LEPRINCE-RINGUET (Ann. Physique, 1937, [xi], 7, 5—70).—The passage through matter of high-energy electrons and protons and the hard and soft components of cosmic radiation has been investigated by means of a large Wilson cloud chamber and magnetic field for the energy range 10^6 — 10^9 e.v. The loss of energy undergone by electrons by binding in the nuclear field and accompanying the emission of photons was studied as a function of electron energy. Results for 1×10^6 — 3×10^6 e.v. electrons through A are 10 times > calc., and indicate a supplementary effect due to absorption. An absorption law for electrons of soft cosmic rays involves the square of the at. no. of the absorbing element. Ultra-penetrating cosmic rays traversing 7 cm. of Pb after passage through the cloud chamber had a min. energy of 9×10^8 e.v., and, for energies > 2.5×10^9 e.v., positively charged particles predominated, supporting the view that ultra-penetrating cosmic rays contain a group of high-energy protons as well as electrons capable of penetrating 7 cm. of Pb. N. M. B.

Angular distribution of the electron-positron pairs liberated by the action of hard γ -rays on lead. H. ADAM (Naturwiss., 1937, 25, 13).—A max. in the angular distribution curve is found at 30° , in agreement with the theory of Dirac. A. J. M.

Symmetry theorem in the positron theory. W. H. FURRY (Physical Rev., 1937, [ii], 51, 125—129).—Mathematical. N. M. B.

Cross-sections of Cl_2 and N_2 for slow electrons. J. B. FISK (Physical Rev., 1937, [ii], 51, 25—28).—Measurements of total cross-sections for collision of slow electrons over 2—40 volts, using a Brode type apparatus, are, for N_2 , in good agreement with available data (cf. Normand, A., 1930, 973) and with elastic scattering theory (cf. Fisk, A., 1936, 263). The val. for Cl_2 is of the order 2000 sq. at. units with a max. at $2.65\sqrt{V}$, the curve being similar to those for Na, K, Cs, and Rb. Only a small portion of these collisions is elastic. N. M. B.

Anomalous scattering of electrons by protons. M. BRONSTEIN (Physikal. Z. Sovietunion, 1936, 9, 537—541).—Theoretical. The cross-sections for the scattering of electrons by protons with and without conservation of energy are calc. O. D. S.

Scattering of electrons by atomic nuclei. R. T. COX and C. T. CHASE (Physical Rev., 1937, [ii], 51, 140—141).—A test, with rigorous exclusion of retarded electrons, confirms Mott's equation for single scattering. N. M. B.

Kinetic energies of atomic ions formed by electron impact in nitric oxide and hydrogen chloride. E. E. HANSON (Physical Rev., 1937, [ii], 51, 86—94; cf. Lozier, A., 1934, 1159).—The energy distribution of the at. ions was measured as a function of the electron energies at impact, and ionisation potentials were determined. Probable vals. of heats of dissociation of the mols. and mol. ions are calc. Negative ions of energy up to 2.5

volts were observed in NO, leading to a calc. electron affinity of $2.1+0.5$ volts for O. Negative ions found in HCl had <0.5 volt energy. Probable processes are: $\text{NO}^+ \rightarrow \text{N}^+ + \text{O}$ ($1D_2$); $\text{NO}^+ \rightarrow \text{N} + \text{O}^+$; $\text{NO} \rightarrow \text{N} + \text{O}$; $\text{NO} + e \rightarrow \text{N} + \text{O}^-$; $\text{HCl}^+ \rightarrow \text{H}^+ + \text{Cl}$ (2P); $\text{HCl}^+ (^2\Pi) \rightarrow \text{H} + \text{Cl}^+$; $\text{HCl}^+ \rightarrow \text{H}^+ + \text{Cl}$; $\text{HCl} \rightarrow \text{H} + \text{Cl}$; $\text{HCl} \pm e \rightarrow \text{H} + \text{Cl}^-$. N. M. B.

Electron and negative ion mobilities in oxygen, air, nitrous oxide, and ammonia. R. A. NIELSEN and N. E. BRADBURY (Physical Rev., 1937, [ii], 51, 69—75).—An extension of investigations using the electrical shutter method (cf. this vol., 56) is reported. Mobility measurements are discussed in relation to inelastic collision, electron drift velocity, character of the ions, and the predictions of Langevin's theory. N. M. B.

Multiple acceleration of light ions to high speeds. E. O. LAWRENCE and D. COOKSEY (Physical Rev., 1936, [ii], 50, 1131—1140; cf. A., 1934, 712).—A detailed description of improvements in and use of the cyclotron apparatus. N. M. B.

Anomalous scattering of protons in light elements. E. G. DYMOND (Proc. Roy. Soc., 1936, A, 157, 302—310).—The scattering of protons, 130—190 e.kv. in energy, from thin films of Ag, Al, B, and Be has been investigated. The scattering from Ag is regarded as classical, and that from other elements referred to it as standard. At 190 e.kv. in Al there is an excess scattering of $17.6 \pm 1.8\%$ at 150° , and $9.7 \pm 1.0\%$ at 110° ; in Be, $4.4 \pm 1.6\%$ at 150° and $13.5 \pm 1.0\%$ at 110° . The scattering in B is normal. It is concluded that proton levels at about 200 e.kv. exist in the Al and Be nuclei. L. L. B.

Separation of lithium isotopes. G. N. LEWIS and R. T. MACDONALD (J. Amer. Chem. Soc., 1936, 58, 2519—2524).—The isotopic ratio $^7\text{Li} : ^6\text{Li}$ has been changed from 11.6 to 5.1 by allowing fine drops of Li amalgam to fall repeatedly through an 18-m. column containing LiCl in EtOH or LiBr in EtOH-dioxan, effecting exchange between Li in the two liquid phases. The electrode potential between amalgam and EtOH solution is 0.0006 volt greater for ^7Li than for ^6Li . E. S. H.

Isotopic weights by the doublet method. F. W. ASTON (Nature, 1936, 138, 1094; cf. A., 1936, 657).—Comparisons of suitable doublets in the second-order focussing mass spectrograph gives the following vals. for isotopic wts. and packing fractions, respectively: ^{28}Si 27.9863 ± 0.0007 , -4.90 ; ^{31}P 30.9836 ± 0.0006 , -5.30 ; ^{32}S 31.9823 ± 0.0003 , -5.53 ; ^{35}Cl 34.9800 ± 0.0008 , -5.71 ; and ^{37}Cl 36.9775 ± 0.0008 , -6.10 . The val. previously obtained for the difference of mass for the fundamental doublet O, CH_4 has been confirmed and the discrepancy between this val. and that obtained by Bainbridge and Jordan (Physical Rev., 1936, [ii], 49, 883) remains unexplained. L. S. T.

Upper limit of atomic numbers. G. FOURNIER (Compt. rend., 1936, 203, 1495—1496).—A geometrical theory of nuclear structure (this vol., 60) gives a max. val. for the at. no. of 136, in accord with the Bohr and Dirac theories. The corresponding max. at. wt. is 360. A. J. E. W.

β -Ray spectra of radium-*E* and radioactive phosphorus. E. M. LYMAN (Physical Rev., 1937, [ii], 51, 1—7).—The end-points of the spectra, obtained by means of a high-resolution magnetic spectrometer, were 1.15 and 1.69 m.e.v. for Ra-*E* and ^{32}P , respectively; these vals. are about 17% < those obtained by extrapolating the Konopinski-Uhlenbeck curve. N. M. B.

Theory of β -decay. A. TER-POGOSSIAN (Physikal. Z. Sovietunion, 1936, 10, 115—116).—Wave-mechanical theory leads to a satisfactory form of the β -spectrum and to an interaction energy between proton and neutron of $5 \times 10^{-150}/r^{11}$ ergs, but the sign is wrong. R. S. B.

Current difference in γ -ray ionisation measurements. E. F. COX (Physical Rev., 1937, [ii], 51, 55—56).—Using the uniform field ionisation chamber (cf. A., 1934, 712), no difference between the no. of positive and negative ions collected per sec., as reported by Broxon (cf. Physical Rev., 1936, [ii], 49, 415) and Clay (cf. Physica, 1935, 2, 825), is found. N. M. B.

Photographic action and absorption coefficients of γ -rays. J. S. ROGERS (Proc. Physical Soc., 1937, 49, 1—11; cf. A., 1932, 671).—The photographic action of γ -rays is intensified by technical X-ray screens > by Pb foil, but these screens intensify the longer λ > the shorter λ . The heterochromatic γ -ray spectrum from Ra-*B* + *C* was analysed into two homogeneous components, the effective λ being the shorter the higher the at. no. of the absorber; absorption coeffs. in Al, Cu, Sn, and Pb were measured. An explanation discussed for the results suggests the presence of lines of moderate intensity of λ < 5.6 X. N. M. B.

Emission of neutrons from chlorine and argon under α -particle bombardment. E. POL-LARD, H. L. SCHULTZ, and G. BRUBAKER (Physical Rev., 1937, [ii], 51, 140; cf. this vol., 108).—A considerable yield of neutrons from ^{40}A is found on bombardment by Th-*C'* α -particles of range $> 5.6 \pm 0.5$ cm., the yield becoming \propto thickness of A traversed at 6.9 ± 0.5 cm. Similar emission was produced by Ra-*C'* α -particles. The neutron energy is approx. 0—1.5 m.e.v. Emission from ^{37}Cl began for α -particle range $> 5.3 \pm 0.5$ cm., and yield was \propto thickness at 7.2 ± 0.5 cm. The suggested reactions are $^{40}\text{A} + ^4\text{He} \rightarrow ^{43}\text{Ca} + ^1_0\text{n}$, and $^{37}\text{Cl} + ^4\text{He} \rightarrow ^{40}\text{K} + ^1_0\text{n}$. Excitation curves suggest nuclear radii 6.1×10^{-13} for ^{37}Cl and 7.3×10^{-13} cm. for ^{40}A . N. M. B.

Magnetic scattering of slow neutrons. L. J. LASLETT (Physical Rev., 1937, [ii], 51, 22—24; cf. Mitchell, A., 1936, 1044).—Scattering by Fe and Ni at room temp. and above the Curie point shows no significant change, indicating that the largeness of these scattering cross-sections is not of magnetic origin. N. M. B.

Magnetic properties of the neutron. J. R. DUNNING, P. N. POWERS, and H. G. BEYER (Physical Rev., 1937, [ii], 51, 51; cf. Bloch, A., 1936, 1173).—A beam of thermal neutrons was passed normally and at angles through Fe sheets magnetised to saturation and scattering due to the plates alone and to the

pole face of a magnet was investigated. Small but consistent differences of counts on reversing the field give no conclusive evidence for the existence of a magnetic scattering effect. N. M. B.

Change in the action of photo-neutrons on silver on passing through a layer of copper, lead, or beryllium. A. LEIPUNSKI and L. ROSENKEVITSCH (Physikal. Z. Sovietunion, 1936, 9, 275—278).—The transmission of neutrons formed by Ra γ -rays on Be has been studied through Cu, Pb, and Be. Retardation occurs due to inelastic scattering with the Cu and Be nuclei and it is suggested that energy levels of the order of 10^5 e.v. may be excited. R. S. B.

Capture of slow neutrons. V. RAJEVSKI (Physikal. Z. Sovietunion, 1936, 9, 109—110).—The relation Q_{ab}/Q_s between between the absorption and the elastic scattering cross-section for slow neutrons is discussed. R. S.

Activity of substances on bombardment by slow neutrons. L. I. RUSINOV and G. D. LATISCHEV (Physikal. Z. Sovietunion, 1936, 9, 287—301).—Results are given for ten elements. Max. activity was obtained in all cases with a 12.5-cm. H_2O filter interposed between source and target. Results do not corroborate Bethe's theory. A. E. M.

Selective absorption of neutrons in silver. E. H. S. BURHOP, R. D. HILL, and A. A. TOWNSEND (Nature, 1936, 138, 1094—1095).—A curve showing the absorption by different thicknesses of B of the neutrons which produce γ -ray activity in Ag is reproduced and discussed. There is an initial steep exponential decrease corresponding with an absorption coeff. of $8.1 \text{ g.}^{-1} \text{ cm.}^2$, and a region of slow, linear decrease corresponding with a coeff. of $0.24 \text{ g.}^{-1} \text{ cm.}^2$. The curve differs from those obtained from the absorption of neutrons which excite the 22 sec. and the 2.3 min. activities in Ag. The nucleus may possess two systems of energy levels corresponding with the emission of β - and γ -radiation. L. S. T.

Activation of silver by neutrons. G. GUEBEN (Nature, 1936, 138, 1095—1096).—Irradiation of Ag with neutrons from a Ra-Be source, with and without interposition of paraffin, gives a radio-element, possibly ^{103}Rh , of 50 sec. period produced by fast neutrons, another of 30 sec. period produced by slow neutrons, and a third of 2.5 min. period, produced by fast and slow neutrons, with an intensity enhanced by interposing paraffin between source and target. L. S. T.

Scattering of neutrons in matter. IV. L. S. ORNSTEIN (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1166—1170; cf. A., 1936, 1441).—Mathematical. J. W. S.

Selective absorption of neutrons. I. KURT-SCHATOV and G. SCHTSCHEPKIN (Physikal. Z. Sovietunion, 1936, 9, 102—105).—Neutrons of low energy are selectively absorbed by Cd whilst Ag absorbs in a high-energy band situated between 10^4 and 10^5 e.v. R. S.

Elastic scattering of neutrons by protons. J. B. FRISK and P. M. MORSE (Physical Rev., 1937, [ii], 51, 54—55; cf. this vol., 6).—Results are plotted

based on the recomputations of elastic scattering formulae with the help of the most recent data (cf. Breit, A., 1936, 1041; Harkins, this vol., 58; Amaldi, *ibid.*). N. M. B.

Slowing down of neutrons in liquid hydrogen. V. FOMIN, F. G. HOUTERMANS, A. I. LEIPUNSKI, and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, 1936, 9, 696—698).—Preliminary. The intensities of radioactivity induced in Ag by a Ra + Be source in liquid H₂ and in H₂O have been compared. The saturation activity in liquid H₂ is about 30% of that in H₂O, and is reached at a low val. of the no. of H atoms between the source and detector. At low val. of the H atoms the increase in activity with increase in the no. is abnormally small. O. D. S.

Deuteron-deuteron reaction. R. LADENBURG and R. B. ROBERTS (Physical Rev., 1936, [ii], 50, 1190).—An investigation of the yields of neutrons and protons produced by bombarding different D targets [ND₄Cl, KOD, (ND₄)₂SO₄, liquid D₃PO₄] with fast deuterons from ion beams and neutrons from a Ra-Be source is described. N. M. B.

Spectroscopic identification and manometric measurement of artificially produced helium. F. A. PANETH, E. GLUCKAUF, and H. LOLEIT (Proc. Roy. Soc., 1936, A, 157, 412—422).—The He produced from B under the impact of slow neutrons, $^{10}\text{B} + {}^4_2\text{He} + {}^7_3\text{Li}$, has been collected by a micro-method. The neutrons from 2.04 curie of Rn, mixed with Be, produced during its decay 2.4×10^{-7} c.c. of He. L. L. B.

α -Particle bombardment of neon, calcium, and argon, and masses of light nuclei. E. POLLARD and C. J. BRASEFIELD (Physical Rev., 1937, [ii], 51, 8—11; cf. this vol., 58).—On bombardment by Th-C' α -particles Ne and Ca, but not A, emit protons. Absorption curves and max. energies were found. The nuclear energy changes -2.6_4 for the Ne reaction and -4.2_3 m.e.v. for Ca. In each case there is only one group. The calc. ^{23}Na mass is 22.9972. A table of isotopic masses for ^{20}Ne — ^{40}A (omitting ^{21}Ne , ^{25}Mg , ^{33}S , and ^{39}K) is calc. N. M. B.

α -Particles from the radioactive disintegration of a light element. W. B. LEWIS, W. E. BURCHAM, and W. Y. CHANG (Nature, 1937, 139, 24).—The β -ray activity resulting from the bombardment of Li by deuterons (A., 1936, 1174) is accompanied by the emission of α -particles, which may result from the disintegration of excited ^8Be nuclei formed in the radioactive disintegration of ^8Li . The evidence indicates that ^8Be is formed in an excited state in a large proportion of the disintegrations of ^8Li . L. S. T.

β -Ray spectrum of ^8Li . E. WIGNER and G. BREIT (Physical Rev., 1936, [ii], 50, 1191).—The mass discrepancy of ^8Li as obtained from $^7\text{Li} + {}^2\text{H} \rightarrow {}^8\text{Li} + {}^1\text{H}$, and $^8\text{Li} \rightarrow {}^8\text{Be} + e^-$ (cf. Rumbaugh, this vol., 5) is explained by supposing that the β -ray spectrum of ^8Li gives rise to an excited nucleus ($^8\text{Be}'$), the reaction being $^8\text{Li} \rightarrow (^8\text{Be}') + e^-$, and the energy difference ($^8\text{Be}' - \text{Be}^8 > 0.0035 \pm 0.001$ mass units. Mechanisms and alternative explanations are discussed. N. M. B.

γ -Radiation emitted from boron on bombardment with rapid protons. W. GENTNER (Naturwiss., 1937, 25, 12).—On bombardment of B with rapid protons γ -rays are emitted with a resonance potential of 180 kv. The excitation function of the rays shows a further increase at 360 kv. The curve is similar to that for the α -rays of range 4.5 cm. which are emitted at the same time as the γ -rays, indicating that both reactions are concerned with the same intermediate nucleus. The energy- and mass-balance of the reaction $^{11}\text{B} + {}^1\text{H} \rightarrow {}^8\text{Be} + {}^4\text{He}$ does not permit the simultaneous emission of γ -rays. It is therefore assumed that the latter arise from an excited ^8Be nucleus, which is left after the emission of α -rays of range < 4.5 cm., at present very difficult to detect. A. J. M.

γ -Radiation from lithium bombarded with protons. E. R. GAERTTNER and H. R. CRANE (Physical Rev., 1937, [ii], 51, 49; cf. Hafstad, A., 1936, 1313).—Further measurements on pair and Compton electron distribution are reported. Strong components of the radiation are found at 14.5, 11, and 8.5, with a small group at 17.5 m.e.v. Conflicting evidence on the reaction mechanisms proposed for the experimental distribution is discussed. N. M. B.

γ -Radiation arising from positron destruction. G. RUMER (Physikal. Z. Sovietunion, 1936, 9, 317—327).—Theoretical. L. G. G.

Angular distribution of the protons and neutrons emitted in some transmutations of deuterium. A. E. KEMPTON, B. C. BROWNE, and R. MAASDORF (Proc. Roy. Soc., 1936, A, 157, 386—399).—The angular distributions for the transmutations $^2\text{D} + {}^2\text{D} \rightarrow {}^3\text{T} + {}^1\text{H}$, and $^2\text{D} + {}^2\text{D} \rightarrow {}^3\text{He} + {}^1\text{n}$, have been studied. The proton and neutron distributions are very similar; in both cases the intensity of emission at angle 0° is about 1.5 times that at 90° . L. L. B.

Transmutation of the lithium isotope of mass seven by deuterons. A. E. KEMPTON, B. C. BROWNE, and R. MAASDORF (Proc. Roy. Soc., 1936, A, 157, 372—385).—The continuous distribution of α -particles formed in the transmutation $^7\text{Li} + {}^2\text{D} \rightarrow {}^4\text{He} + {}^4\text{He} + {}^1\text{n}$ (i) has been investigated. No evidence has been obtained for the formation of a ^9He nucleus. The observed neutron energy distribution and the α -particle distribution are in qual. agreement if it is assumed that (i) takes place with the temporary formation and subsequent break-up of a ^9Be nucleus. L. L. B.

Artificial radioactivity. A. I. ALICHANIAN, A. I. ALICHANOV, and B. S. DZELEPOV (Physikal. Z. Sovietunion, 1936, 10, 78—102).—The β -ray spectra of radioactive P, Mn, Br I, II, and III, Rh I, Ag I, I, Ir, and Au formed by neutron bombardment have been studied. The relation between the decay consts. and the spectral limits cannot be expressed by Sargent's law or by Fermi's theory. R. S. B.

Radioactivity induced in sulphur. R. SAGANE (Physical Rev., 1936, [ii], 50, 1141—1145).—Under bombardment with 4—6 m.e.v. deuterons, S became radioactive with emission of both positive and

negative electrons, of decay periods 3 ± 0.1 , 33 ± 1 min., and 14 ± 0.3 days, having their origin in ^{30}P , ^{34}Cl (positron emitters), and ^{32}P (electron emitter). The energy distribution of positrons from Cl was studied by a cloud chamber. When bombarded by neutrons two radioactive substances which emit negative electrons were produced; the half-val. periods were 2.6 ± 0.2 hr. and 14 days, characteristic of ^{31}Si and ^{32}P . N. M. B.

Radioactivity in tantalum on neutron bombardment. V. FOMIN and F. G. HOUTERMANS (Physikal. Z. Sovietunion, 1936, 9, 273—274).—The half period of the radioactivity induced in Ta by neutrons is 200 ± 100 days, and the β -radiation emitted is very soft. R. S. B.

Intermediate nucleus and atomic disintegration in steps. W. D. HARKINS (Physical Rev., 1937, [ii], 51, 52—53).—The postulates of a theory that the first step in a nuclear reaction is the synthesis of an intermediate nucleus (cf. A., 1934, 1151) are developed in detail and experimental evidence is adduced. N. M. B.

Absolute intensity of cosmic radiation at sea-level. J. CLAY and H. F. JONGEN (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1171—1173).—The ionisation by cosmic rays has been determined in a cylindrical vessel and with field strengths > 600 volts per cm., and the saturation current for various pressures deduced. At 23—38 atm. the wall ionisation is const., and it is deduced that the ionisation at sea-level under 12 cm. of Fe is 1.11 ion per c.c. in air at 1 atm., and for an open vessel 1.60 ion per c.c. The ionisation produced by electrons ejected from Fe is 21 ions per sq. cm. J. W. S.

Hard component of cosmic rays. B. GROSS (Physical Rev., 1936, [ii], 50, 1188—1189; cf. A., 1935, 278).—The range distribution obtained by extrapolation of the depth-ionisation curve is investigated. N. M. B.

Numerically consistent corpuscular theory of cosmic rays. W. F. G. SWANN (Physical Rev., 1936, [ii], 50, 1103—1119).—A mathematical and theoretical survey. N. M. B.

Cosmic rays as electrical particles. A. H. COMPTON (Physical Rev., 1936, [ii], 50, 1119—1130).—A general review of evidence for and against the electrical particle view. N. M. B.

Atomic synthesis and stellar energy. III. R. D'E. ATKINSON (Astrophys. J., 1936, 84, 73—84).—The synthesis theory of stellar energy (A., 1931, 1104) is reviewed in the light of recent knowledge concerning neutrons, deuterons, and positrons. It is concluded that a star probably contains no large amount of free neutrons or deuterons, and it is likely that deuterons, but not neutrons, could be made directly from protons under stellar conditions. L. S. T.

Solid-body model of heavy nuclei. J. FRENKEL (Physikal. Z. Sovietunion, 1936, 9, 533—536).—The theory of Bohr (A., 1936, 403) is applied to collision between a heavy nucleus and an electron or proton. O. D. S.

Collisions of slow neutrons with protons. V. I. MAMASACHLISOV (Physikal. Z. Sovietunion, 1936, 9, 198—209).—The interaction of protons and neutrons has been studied by wave-mechanics, with good agreement with experiment for the dimensions of the potential barrier. R. S. B.

Capture of orbital electrons by nuclei. C. MÖLLER (Physical Rev., 1937, [ii], 51, 84—85).—The relative probabilities of the transformation of a nucleus of charge Z into one of charge $Z-1$ by the emission of a positron or by absorption of an orbital electron are examined. N. M. B.

Theoretical constitution of metallic potassium. E. GORIN (Physikal. Z. Sovietunion, 1936, 9, 328—344).—A wave-mechanical calculation of the binding energies and lattice const. in metallic K. L. G. G.

Structure of the nuclei between helium and oxygen. E. FEENBERG and E. WIGNER (Physical Rev., 1937, [ii], 51, 95—106).—Mathematical. Applications of nuclear forces are tested. N. M. B.

Relative stabilities of isotopes of the lighter elements. W. M. LATIMER (Physical Rev., 1937, [ii], 51, 141).—A simple means of calculating, up to ^{37}Cl , which isotopes are stable is described. N. M. B.

Connexion between masses of light atoms. W. BOTHE and H. MAIER-LEIBNITZ (Naturwiss., 1937, 25, 25—26).—The curves connecting mass excess (ΔM) with mass no. (A) obtained by Oliphant (A., 1936, 540) indicate that either ^4He or ^7Li should be a stable nucleus. It is shown that ΔM for light atoms can be expressed as a function of A and the nuclear charge Z , the simplest form of the function being obtained when $A - 2Z$ is taken as parameter. For $A - 2Z = -1$ or $+1$, the vals. of ΔM lie on smooth curves. For $A - 2Z = 0$ the atoms with an even no. of protons have smaller ΔM than those with an odd no. The points for the two types lie on two separate smooth curves. The same effect is found for $A - 2Z = 2$, but the difference in ΔM for the two types of atom is less. This is in agreement with the neutron-proton structure of the nucleus, and especially with Weizsacker's theory (A., 1935, 1297). ^5He and ^7Li have very large ΔM and should therefore be extremely α -unstable. The same is probably true of ^7Be . ^8B should break down into ^4He and ^4H . ^4H should be β -active, but of very short life. A. J. M.

Theory of complex atoms. D. R. H(ARTREE) (Nature, 1936, 138, 1080—1082).—A review of papers to the British Association. L. S. T.

Relation between the action function and the force acting on the electron. (MME.) M. A. TONNELAT-BAUDOT (Compt. rend., 1936, 203, 1332—1333).—Theoretical. H. J. E.

Dirac vector model for two non-equivalent electrons in the atom. I. SCHAFOSCHNIKOV (Physikal. Z. Sovietunion, 1936, 9, 618—629).—Mathematical. O. D. S.

Exchange forces between elementary particles. V. F. WEISSKOPF (Physical Rev., 1936, [iii], 50,

1187—1188).—Mathematical. The interaction term introduced by the Fermi theory of β -decay is examined.

N. M. B.

Is the momentum a sufficient description of a photon or an electron? H. R. CRANE (Physical Rev., 1937, [ii], 51, 50).—The photons responsible for the 17.5-m.e.v. electrons from Li (cf. this vol., 108) may differ in time of emission and in extreme shortness of wave train from those responsible for the lower groups. The consequences of this introduction of an additional variable in the description of the individual photon are discussed.

N. M. B.

Self-consistent field and Bohr's nuclear model. W. M. ELSASSER (Physical Rev., 1937, [ii], 51, 55).—The relation between the Bohr semi-classical nuclear model (cf. A., 1936, 403) and the Hartree-Fock model of one-particle orbits is examined.

N. M. B.

Consequences of the symmetry of the nuclear Hamiltonian on the spectroscopy of nuclei. E. WIGNER (Physical Rev., 1937, [ii], 51, 106—119; cf. Fernberg, this vol., 109).—Mathematical. The structure of the multiplets of nuclear terms is investigated.

N. M. B.

Wave mechanics of couples (neutron-neutrino). M. BORN (Nature, 1937, 139, 68).—Theoretical. β -Decay is considered as a special case of processes in which a couple of particles (neutron-neutrino) are involved. The principal feature of these processes is that the rest-mass of the single particle is not conserved, but only that of a couple as a whole.

L. S. T.

Electronic nature of light. J. J. PLACINTEANU (Compt. rend., 1936, 203, 1343—1345).—Theoretical.

H. J. E.

Neutrino theory of light. D. IVANENKO and A. SOKOLOV (Physikal. Z. Sovietunion, 1936, 9, 692—695).—Mathematical.

O. D. S.

Spark discharge at the surface of an electrolyte connected to the negative pole. P. JOLIBOIS and R. BOSSUET (Compt. rend., 1936, 203, 1497—1498; cf. A., 1936, 655).—Spectral data are given; the luminous spot on the liquid surface gives lines due to H and O, the spark giving N bands and a line spectrum of the metal in solution. 1 mg. of Mn per litre could be detected in presence of NH_4Cl .

A. J. E. W.

Absorption spectra and photosensitising activity of white pigments. C. F. GOODEVE (Trans. Faraday Soc., 1937, 33, 340—347).—The diffuse reflecting powers of TiO_2 , ZnO , PbCO_3 , BaSO_4 , and white lead have been measured and the absorption spectra and threshold $\lambda\lambda$ deduced. The results are discussed with reference to the photosensitising action of these pigments.

J. W. S.

Low-dispersion of red stars. R. WILDT (Astrophys. J., 1936, 84, 303—318).—Various absorption bands in the far ultra-violet are tentatively attributed to CN, CH, NH, OH, and CaH.

L. S. T.

Variations of the absorption coefficients of ozone and the temperature of the upper atmosphere. E. VASSY (Compt. rend., 1936, 203, 1363—1365; cf. A., 1936, 1208).—Measurements of the

absorption coeffs. at the absorption min. ($\lambda\lambda$ 3359—3110 Å.) are recorded. The vals. diminish linearly with temp. (20° to —80°). The application of these facts in measuring the atm. temp. is discussed.

H. J. E.

Ultra-violet absorption spectrum of ozone. A. JAKOVLEVA and V. KONDRATEEV (Physikal. Z. Sovietunion, 1936, 9, 106—108).—A formula for the heads of O_3 absorption bands between 3660 and 3080 Å. is given. The dissociation energy of the excited O_3 is 0.55 volt. It is suggested that this, together with the normal state, are singlet states, and that O_3 is diamagnetic.

R. S.

Effect of hydrogen bond formation on fundamental frequencies of OH radical. A. M. BUSWELL, V. DEITZ, and W. H. RODEBUSH (J. Chem. Physics, 1937, 5, 84).—H bond formation leads to the disappearance of the first harmonic of the OH group and appears to lead to a displacement of the fundamental to longer λ .

W. R. A.

Vibrational analysis of the emission bands of germanous oxide. R. W. SHAW (Physical Rev., 1937, [ii], 51, 12—14).—An analysis for 21 bands degraded to the red is tabulated for the region $\lambda\lambda$ 2500—2900, and an expression for the band heads is given. The internuclear distance is 1.65 ± 0.06 Å.

N. M. B.

Absorption spectrum of ruthenium tetroxide. S. E. KRASIKOV, A. N. FILIPPOV, and I. I. TSCHERNIAEV (Ann. Sect. Platine, 1936, 13, 19—20).—Characteristic absorption bands of RuO_4 vapour occur at 2990, 3064, 3138, and 3212 Å.

R. T.

Third absorption bands of co-ordination compounds. I. $[\text{Co}(\text{NH}_3)_4\text{ClNO}_2]\text{Cl}$ and $[\text{Co}(\text{NO}_2)_6]\text{Na}_3$. R. TSUCHIDA and S. KASHIMOTO (Bull. Chem. Soc. Japan, 1936, 11, 785—790).—Extinction coeffs. of solutions of $[\text{Co}(\text{NO}_2)_6]\text{Na}_3$, $[\text{Co}(\text{NH}_3)_4\text{ClNO}_2]\text{Cl}$, $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]\text{Cl}$, and $[\text{Co}(\text{NH}_3)_2(\text{NO}_2)_4]\text{NH}_4$ have been determined. Three similarly situated absorption bands were found for each substance. The presence of the third band is attributed to a pair or pairs of negative radicals co-ordinated in *trans*-positions to each other. The results are discussed in conjunction with data for tetrammine and pentammine cobaltic salts.

J. G. A. G.

Spectrum and photochemistry of carbon suboxide. H. W. THOMPSON and N. HEALEY (Proc. Roy. Soc., 1936, A, 157, 331—347).—The ultra-violet absorption spectrum of C_3O_2 is composed of both banded and continuous regions. The frequencies of the normal valency vibrations of the mol. have been calc., on the basis of the force consts. of the linkings involved. A scheme of energy levels for the mol. is suggested. No fluorescence is observed. Illumination of C_3O_2 with the light of a Hg arc leads chiefly to a polymerisation and little decomp. Badger and Barton's data (A., 1934, 581) are not confirmed.

L. L. B.

Absorption spectra of salts of ytterbium in crystals and solutions compared with those of cerium. S. FREED and R. J. MESIROW (J. Chem. Physics, 1937, 5, 22—25).—The absorption spectra of YbCl_3 , $\text{Yb}(\text{OAc})_3$, and $\text{Yb}(\text{EtSO}_4)_3$ closely resemble

those of the corresponding Ce salts especially in their diffuseness at low temp., in contrast to the sharp spectra of the other rare earths. Lattice forces do not introduce any modifying influences and the Pauli exclusion principle can be applied to the absorption spectra of crystals and solutions of salts in exactly the same way as it is applied to the spectra of gaseous ions.

W. R. A.

Absorption spectra of samarium tungstate and molybdate at low temperatures. S. FREED and E. L. HÄRNISCH (*J. Chem. Physics*, 1937, 5, 26—29).—The absorption spectra of single crystals of $\text{Sm}_2(\text{WO}_4)_3$ and $\text{Sm}_2(\text{MoO}_4)_3$ have been photographed at several temp. between 78° and 298° abs. The dissimilarity in the spectra indicates that the crystals belong to different space-groups, whilst crystallographic data suggest the same space-group. Evidence of dissociation into basic and acidic oxides within the crystals at the higher temp. is obtained.

W. R. A.

Line absorption spectrum of gadolinium ion in crystals. G. C. NUTTING and F. H. SPEDDING (*J. Chem. Physics*, 1937, 5, 33—45; cf. A., 1933, 336).—Absorption spectra of the Gd^{+3} ion in hexagonal crystals of $(\text{HCO}_2)_3\text{Gd}$, $\text{Gd}(\text{BrO}_3)_3 \cdot 9\text{H}_2\text{O}$, and $\text{Gd}(\text{EtSO}_4)_3 \cdot 9\text{H}_2\text{O}$, in monoclinic crystals of $\text{Gd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$, $\text{Gd}_2(\text{SeO}_4)_3 \cdot 8\text{H}_2\text{O}$, $(\text{EtCO}_2)_3\text{Gd} \cdot 3\text{H}_2\text{O}$, and $(\text{PrCO}_2)_3\text{Gd} \cdot 2\text{H}_2\text{O}$, in triclinic crystals of $\text{Gd}(\text{OAc})_3 \cdot 4\text{H}_2\text{O}$, and in $(\text{CCl}_3\text{CO}_2)_3\text{Gd} \cdot 3\text{H}_2\text{O}$, $(\text{CCl}_3\text{CH}_2\text{CH}_2\text{CO}_2)_3\text{Gd} \cdot 10\text{H}_2\text{O}$, and $(\text{PrCO}_2)_3\text{Gd} \cdot 6\text{H}_2\text{O}$ have been investigated between 300° and 20° abs. Lattice symmetry, and not the negative ion, determines the splitting of multiplets or excited levels; H_2O of crystallisation does not affect the spectra. The results are interpreted to indicate that all the lines of the multiplets of the inorg. salts and most of the lines of the org. salts arise from the crystal Stark splitting of lines in the spectrum of gaseous Gd^{+3} .

W. R. A.

Influence of electric field on the absorption spectrum of the acetylene flame. A. E. MALINOVSKI and V. S. ROSSICHIN (*Physikal. Z. Sovietunion*, 1936, 9, 268—270; cf. A., 1936, 572).—The absorption spectrum of burning 25% C_2H_2 and 75% air in an electric field shows a missing line and the disappearance of the continuous region in the ultra-violet of the normal spectrum without field, using a C arc. The field removes the charged particles from the flame and hence decreases absorption.

R. S. B.

Absorption spectra of crystals at low temperatures. II. Absorption spectrum of phenanthrene at 20° abs. III. Spectrum of anthracene at 20° abs. I. V. OBREINOV and A. PRICHOTKO (*Physikal. Z. Sovietunion*, 1936, 9, 34—47, 48—56; cf. A., 1932, 674).—II. The absorption spectrum for polarised light depends on the direction of the electric vector. When this is parallel to the plane (010) the bands are narrower. Three regions are distinguished, viz., the near spectrum consisting of few lines and narrow weak bands extending from 26,000 to 28,000 cm^{-1} , the main spectrum of two series of narrow bands between 28,000 and 33,000 cm^{-1} , and the far spectrum of broad, diffuse bands beyond

33,000 cm^{-1} . The intensity increases in the same order.

III. The near spectrum is absent in the case of anthracene and the main spectrum consists of some intense doublets and fainter bands slightly sharper than at -190° but otherwise the same. Broad, diffuse bands which shift with change of temp. are obtained in the far spectrum when the electric vector is normal to the plane (010) of symmetry. The absorption of cryst. anthracene is discussed in relation to that of the vapour.

R. S.

Ultra-violet absorption spectra of maleo-nitrile. E. RUPPOL (*Bull. Acad. roy. Belg.*, 1936, [v], 22, 1166—1168).—Data and absorption curve for the nitrile in EtOH are given. Comparison of maleo- with fumaro-nitrile (A., 1935, 563) shows that in dil. solution the absorption spectra are similar but in conc. solution absorption of fumaro- is $>$ that of maleo-nitrile.

F. O. H.

Amino-acids, acylamino-acids, dipeptides, acyldipeptides, and derivatives of these compounds. I. Absorption spectra. M. A. MAGILL, R. E. STEIGER, and A. J. ALLEN (*Biochem. J.*, 1937, 31, 188—194).—Curves are given showing the absorption of many compounds between 2100 and 3000 Å. at room temp. A dipeptide has greater absorption than an equimol. mixture of its constituents. Replacement of an $\text{NH}_2\text{-H}$ by Ac shifts the absorption to longer λ . In six pairs of acetyldipeptides the compound with the NH_2 -acid of higher mol. wt. acetylated has lower absorption than its position isomeride.

R. M. M. O.

Spectra of heliocorubin and oxyhelicorubin.—Sec A., III, 83.

Pressure broadening of the HCN band lines and intermolecular forces. G. HERZBERG, J. W. T. SPINKS, and W. W. WATSON (*Physical Rev.*, 1936, [ii], 50, 1186).—Photometric examinations of previous spectrograms in the near infra-red of HCN, C_2H_2 , HCl, and CH_4 are discussed. Results do not support the views of Cornell (cf. A., 1936, 1179). The HCN line width is considerably the largest, and there is evidence of large van der Waals forces which perturb the absorbing mols.

N. M. B.

Pressure broadening in bands of dipole molecules. W. W. WATSON and H. MARGENAU (*Physical Rev.*, 1937, [ii], 51, 48).—The relatively large broadening of HCN band lines must be due to large perturbing forces. The contribution of dipole alignment effect to dipole interaction is discussed qualitatively. Conclusions indicate that such effect should, at least at low temp., produce an asymmetry to the blue in the line originating in the lowest level.

N. M. B.

Absorption spectrum of ammonia in the very near infra-red (6000—9500 Å.). G. COSTEANU and P. BARCHEWITZ (*Compt. rend.*, 1936, 203, 1499—1501).— λ for the liquid, gas, and aq. solutions are tabulated. Bands for the liquid are classified, and harmonics considered.

A. J. E. W.

The 2.73μ absorption band of fused silica. J. W. ELLIS and W. K. LYON (*Nature*, 1937, 139,

70).—No trace of this band could be detected in manufactured quartz specimens, which probably contain CO_2 (cf. A., 1936, 1318). L. S. T.

The $2.73\ \mu$ absorption band of fused silica. D. G. DRUMMOND (Nature, 1937, 139, 70).—The view that CO_2 impurity is the cause of the band appears to be no longer tenable (cf. preceding abstract). In a specimen which showed the $2.73\ \mu$ band, the H_2O vapour bands near 1.36 and $1.87\ \mu$ were absent. The 2.73 band has been observed in emission from hot, fused SiO_2 . L. S. T.

Infra-red absorption spectrum of hydrogen chloride in solution. W. WEST and R. T. EDWARDS (J. Chem. Physics, 1937, 5, 14–22; cf. A., 1936, 545).—The infra-red absorption bands of HCl in non-ionising solvents near $3.5\ \mu$ and $1.8\ \mu$ show no rotational structure and have usually two components of unequal intensities, and the absorption region is displaced to frequencies $<$ for the gas. The displacement is independent of concn., up to mol. fraction 0.1, increases with diminishing temp. in certain solvents, and is approx. the same for both bands. The interval between the two components in both bands varies directly with the dielectric const. of the solvent. W. R. A.

Infra-red absorption of formaldehyde vapour. E. S. EBERS and H. H. NIELSEN (J. Chem. Physics, 1937, 5, 84).—Preliminary results on the infra-red spectrum of CH_2O vapour between 1 and $11\ \mu$ are reported. W. R. A.

Rotation-vibration spectrum of C_2H_6 and the question of internal rotation. J. B. HOWARD (Physical Rev., 1937, [ii], 51, 53).—A dynamical study of a C_2H_6 model showing how the rotation-vibration spectrum will change in the transition from free to completely restricted internal rotation gives a lower limit of 2000 g.-cal. for the potential restricting internal rotation of Me groups about the symmetry axis. N. M. B.

Infra-red absorption of [methyl] alcohol-acetone mixtures. W. GORDY (Physical Rev., 1936, [ii], 50, 1151–1153).—Transmission curves for various mixtures in the region 2.5 – $8.5\ \mu$ are given. COMe_2 shifts the OH vibrational band of MeOH to shorter $\lambda\lambda$ and appreciably increases its intensity; MeOH increases the intensity of the CO vibrational band of COMe_2 and shifts it to longer $\lambda\lambda$. No other bands are affected. Results indicate association of MeOH and COMe_2 , through interaction of OH and CO. Proton bond formation is suggested. N. M. B.

Infra-red absorption spectra and modes of vibration of organic compounds containing an ethylenic linking. J. LECOMTE (Compt. rend., 1936, 203, 1501–1503).—Observed data for compounds of the type $\text{R}\cdot\text{CH}:\text{CH}\cdot\text{CH}_2\cdot\text{X}$ ($\text{X} = \text{OH}, \text{CN}, \text{Br}$) are considered to arise from the existence of two forms of mol. (cf. A., 1935, 1053). Vibrational frequencies are given. A. J. E. W.

Structure of liquids studied in the infra-red. J. ERRERA (Trans. Faraday Soc., 1937, 33, 120–129).—Very pronounced absorption bands in the infra-red between $\lambda\ 52$ and $152\ \mu$ are observed in

dipolar substances, and the abs. val. of the extinction coeff. is that deduced from the relaxation time measured in the hertzian region by the Debye dispersion formula. Intra- or inter-mol. movements are considered responsible for the observed deviations from theory. F. L. U.

Dependence of the scattering of light on wavelength. L. V. SMIRNOV and N. M. BASHENOV (Kolloid. Shur., 1935, 1, No. 2, 89–97; cf. A., 1935, 932).—The power to which λ is raised in the Rayleigh formula is calc. for non-metallic spheres; it is > 3.95 when the radius r of the particle is $< 30\ \text{m}\mu$, but becomes negative when r is $> 170\ \text{m}\mu$. J. J. B.

Raman spectra and constitution of liquids. M. MAGAT (Trans. Faraday Soc., 1937, 33, 114–120; cf. A., 1936, 1179).—The Raman effect in liquids leads to a quasi-cryst. (as opposed to a micro-cryst.) hypothesis of structure. It also shows that liquids may possess intervals of transformation associated with free rotation. F. L. U.

Raman effect in solutions in [liquid] ammonia. I. M. V. VOLKENSTEIN (Acta Physicochim. U.R.S.S., 1936, 5, 627–644; cf. A., 1936, 137, 1449).—Raman spectra of solutions of NH_4NO_3 , NH_4CNS , $\text{NH}_4\text{NO}_3 + 3\text{NH}_4\text{CNS}$, and AgCl in liquid NH_3 have been measured. Frequencies due to liquid NH_3 differ from those observed with the gas. Lines characteristic of NO_3' and CNS' , but not NH_4' , were observed. The absence of NH_4' frequencies is explained as due to the formation of $[\text{H}(\text{NH}_3)_n]'$. F. L. U.

Raman spectrum of an aqueous solution of KSeCN . V. KONDRATEEV and O. SETKINA (Physikal. Z. Sovietunion, 1936, 9, 279–286).—The Raman spectrum of aq. KSeCN shows two lines $\nu_1 = 2051.5\ \text{cm}^{-1}$ and $\nu_2 = 575\ \text{cm}^{-1}$, attributed to the ion NCSe^- . Force consts. (C:N) for the ions NCS^- and NCSe^- are calc. by the usual equations and found to be $13\% <$ in the case of the isosteric mols. NCCl and NCBr . This anomalous result is discussed. H. C. G.

Intensity and depolarisation of Raman lines emitted by sulphuric acid-nitric acid mixtures. J. CHÉDIN (Compt. rend., 1936, 203, 1509–1511).—The proportions of free N_2O_5 present in H_2SO_4 – HNO_3 – H_2O mixtures with low H_2O content (0–15%) were investigated by observing the intensity of a Raman line due to N_2O_5 . A. J. E. W.

Raman spectra of some simple molecules in solution. W. WEST and P. ARTHUR (J. Chem. Physics, 1937, 5, 10–13).—Raman spectra of HCl , HBr , SO_2 , and NH_3 in various non-ionising solvents indicate that the vibration frequencies in the solute mol. are $<$ in the gas state. The shift for the H halides is $>$ for the other two, and a definite relation between the frequency shift and the dielectric const. of the solvent appears to exist for the halides. Conc. solutions of HCl and HBr in several ionising solvents have no lines identifiable as vibrations in HCl or HBr mols. The bearing of these results on the dissociation process of HCl in solvents is discussed. W. R. A.

Vibrations of the ethylene molecule. S. BHAGAVANTAM (Nature, 1936, 138, 1096—1097).—Depolarisation factors of 0.10 and 0.17, respectively, have been obtained for the Raman lines 3019.0 and 1343.9, and are in accord with theory. The two weak lines at 2880 and 1656 which are not fundamentals have now been observed in the Raman spectrum of the gas as well as in the liquid (cf. A., 1936, 269). L. S. T.

Absolute measurement of light diffused by liquid benzene. P. PEYROT (Compt. rend., 1936, 203, 1512—1514).—Rayleigh's ratio, R , for C_6H_6 is $(34.8 \pm 2.3) \times 10^{-6}$ cm.⁻¹, for light of λ 4358 Å., and at 24°. Vals. of R obtained for H_2O and 10 aliphatic compounds agree with vals. deduced from the Vessot-King formula. R for C_6H_6 , PhMe, and *m*-xylene is abnormally high. A. J. E. W.

Raman spectrum of benzene vapour. S. BHAGAVANTAM and A. V. RAO (Nature, 1937, 139, 114—115).—The principal line at 992 shows no change, but the line at 3061 in the liquid shifts to 3069 in the vapour, and 3047 is either considerably weakened or has disappeared. Alterations which occur in the structure and intensity of the "rotation wings" accompanying the Rayleigh lines are described. L. S. T.

Effect of an electric field on the polarisation of the Raman lines. R. LANGENBERG (Ann. Physik, 1937, [v], 28, 132—136).—The degree of depolarisation of the Raman lines of C_6H_6 and PhMe when electric fields of different strengths are applied has been determined. The changes observed in the degree of depolarisation on applying the field are within experimental error, and the effect noted by Sirkar (A., 1934, 942) is not real. A. J. M.

Raman effect. LXI. Raman spectra of organic substances. Benzene derivatives. XI. L. KAHOVEC and A. W. REITZ (Monatsh., 1936, 69, 363—376).—Data are recorded for PhSH, PhSMe, PhSEt, NHPHMe, NHPHPhEt, NPhMe, NPhEt₂, NHPHPhPr, PhOEt, CH₂Ph-OMe, PhPr, PhPr², (SPh)₂ and $C_6H_5Br_3$, and certain anomalies discussed. J. W. S.

Raman effect of some organic sulphur compounds. L. MÉDARD and F. DÉGUILLON (Compt. rend., 1936, 203, 1518—1521).— $\lambda\lambda$ for Me_2S , Me_2S_2 , PhSH, $MeSO_4^-$, and $EtSO_4^-$ are given and discussed, particularly in regard to the ions involved. A. J. E. W.

Raman effect and the concept of odour.—See A., III, 93.

Decay of phosphorescence in boric acid and aluminium sulphate preparations. V. L. LEV-SCHIN and L. A. VINOKUROV (Physikal. Z. Sovietunion, 1936, 10, 10—33).—The phosphorescence of boric acid and $Al_2(SO_4)_3$, activated by uranin, eosin, aesculin, naphthionic acid, and erythrosin, decays exponentially. The mean life of the excited state is independent of λ at 330—620 m μ and decreases with increasing concn. (c) of activator. Initial intensity decreases with increasing c. Fluorescence and phosphorescence spectra are similar. The dyes are active in the order given. The results resemble those with

solid solutions of the dyes and differ from those with crystals activated by metals. The mechanism of quenching is discussed. R. S. B.

Fluorescence of platinocyanides. J. A. CHVOSTIKOV (Physikal. Z. Sovietunion, 1936, 9, 210—236).—The emission and absorption fluorescence spectra of K, Ba, and Mg platinocyanides has been studied in aq. solution, mainly with the K salt up to 5.1×10^{-2} g. per c.c. The polarisation of the fluorescence depends on η in presence of glycerol, according to Perrin's formula. The life of the excited state is 2.5×10^{-10} sec., and the fluorescence yield for the K salt 4.5%. The temp. coeff. is negative. The dependence of fluorescence and polarisation on λ has been studied at λ 230—350 m μ . R. S. B.

Weak phosphorescence in the ultra-violet by the light-counting tube method. M. L. KATZ (Physikal. Z. Sovietunion, 1936, 9, 254—258).—The phosphorescence of blue fluor spar in light of 4047 and 4078 Å. has been studied by means of the light-counting tube and lies in the region 2400—2950 Å. R. S. B.

Absolute efficiency of fluorescence of potassium uranyl sulphate. M. M. GUREVITSCH and L. TSCHACHROV (Bull. Acad. Sci. U.R.S.S., 1936, 509—513).—The light efficiency of $K_2UO_2(SO_4)_2$ screens amounts to about 200 lumens per watt of incident ultra-violet light energy. The use of such screens increases the illuminating efficiency of a black body at 3000° by 20%, and of high- and low-pressure Hg-vapour lamps by 50 and 200%, respectively. R. T.

Fluorescence of aqueous diacetyl solutions. K. KALLE (Naturwiss., 1937, 25, 61).—When aq. Ac_2 is irradiated with ultra-violet light a yellowish-green fluorescence is observed after a short time (a few sec. to 1 min. according to the concn. of the solution). It starts from one or more centres and travels slowly over the part of the liquid irradiated. If the liquid is shaken so that the reaction occurs uniformly throughout the liquid, and it is then placed in the dark, the whole process may be repeated after about 15 min. After 10 repetitions the intensity of the fluorescence decreases to about one third. Addition of dil. acid has no effect, but addition of alkali prevents the reaction, and destroys any fluorescence centres already formed. A. J. M.

Invisible radiation in gaseous reactions. I. K. JABŁCZYŃSKI and W. ORŁOWSKI (Rocz. Chem., 1936, 16, 406—410).—Radiation is detected photographically in the reactions between O_3 and S or H_2S , H_2S and NH_3 or SO_2 , and NH_3 and SO_2 , but not between Br and SO_2 or NH_3 , and O_3 and MnO_2 or Pt-asbestos. R. T.

"Specific action" of ultra-short wireless waves. W. E. CURTIS, F. DICKENS, and S. F. EVANS (Nature, 1936, 138, 1100—1101; cf. *ibid.*, 63).—A reply to criticism. L. S. T.

Time lag of the vacuum photo-cell. R. A. HOUSTON (Nature, 1937, 138, 29—30).—The lag for a G.E.C. cell, KV6, is found to be 5×10^{-10} sec. The KMV6 cell shows no lag. L. S. T.

Velocity distribution of photo-electrons on composite caesium electrodes. A. I. PIATNITZKI and P. V. TIMOFEEV (Physikal. Z. Sovietunion, 1936, 9, 187—197).—The distribution of velocity (v) of photo-electrons formed by Cs-S and Cs-O cathodes has been studied with λ 4358—5790 Å. at 20°. With increasing λ the max. of the distribution curves is displaced towards greater v . The curves are dependent on the nature of the cathode. R. S. B.

Fatigue of oxygen-caesium photo-cathodes. P. V. TIMOFEEV and N. S. KONDORSKAJA (Physikal. Z. Sovietunion, 1936, 9, 683—691).—The fatigue in a vac. photo-cell with cathode formed by condensation of Cs vapour on a Ag₂O layer increases with increasing illumination and with increase in applied voltage at const. current. The fatigue at room temp. is partly, and at liquid N₂ temp. completely, reversible. The spectral distribution of sensitivity is altered by fatigue. Fatigue is due to the loss of free Cs atoms from the surface by their diffusion as positive ions into the body of the cathode. O. D. S.

Origin of uni-polar electrical conductivity of carborundum. S. R. KHASTGIR (Nature, 1937, 139, 28—29). L. S. T.

Electroresistive effect and a rectifying property of carborundum crystals. H. ÖSTERBERG (Physical Rev., 1936, [ii], 50, 1187).—The electrical resistances of single homogeneous crystals of carborundum and zincite vary rapidly with applied voltage even under isothermal conditions and for uniform voltage gradients. The isothermal variation of resistance with voltage, or electroresistive effect, is examined mathematically. N. M. B.

Absorption of light and the trapping of electrons and positive holes in crystalline dielectrics. J. FRENKEL (Physikal. Z. Sovietunion, 1936, 9, 158—186).—Theoretical. The production of "excitons" by the absorption of light by a cryst. dielectric is studied. The theory explains the trapping characteristics of dielectrics and semi-conductors without recourse to impurities or inhomogeneities. R. S. B.

Variation with temperature of the reverse photo-electric effect in cuprite crystals. N. J. BARBAUMOV and R. G. JENSCH (Physikal. Z. Sovietunion, 1936, 9, 345—351).—Measurements were made with natural crystals between —55° and 84°. In the region > 6600 Å. the temp. behaviour is different from the normal effect. For the region < 6100 Å. the variation with temp. is the same as with the normal effect. A. E. M.

Influence of supplementary light on the crystal photo-effect in cuprous oxide. N. O. BARBAUMOV and R. G. JENSCH (Physikal. Z. Sovietunion, 1936, 9, 94—96).—The influence on the photo-effect- λ curve of a supplementary beam perpendicular to the principal beam has been studied. When the supplementary λ is > that corresponding with the curve max., the photo-effect is increased at shorter $\lambda\lambda$ to an extent > the additive val. for both $\lambda\lambda$ and *vice versa*. R. S.

Influence of double illumination on the crystal photo-effect of cuprous oxide. N. J. BARBAUMOV

and R. G. JENSCH (Physikal. Z. Sovietunion, 1936, 9, 551—562; see preceding abstract).—The spectral distribution between 4500 and 7600 Å. of the photo-effect in a Cu₂O single crystal has been investigated with and without simultaneous illumination in directions parallel, opposite, or perpendicular to the primary by $\lambda\lambda$ 5400, 6200, and 7200 Å., the photo-effect of the secondary beam alone being compensated. A dependence on the direction of the secondary beam was observed for $\lambda\lambda$ 5400 and 6200 Å. combined with a primary λ > 5800 Å. The variation with intensity of the secondary beam has been investigated for the primary-secondary pairs: 6800—5400, 5400—6200, 6800—6200, and 7600—7200 Å. Saturation at high intensities was observed when the secondary λ was < that of the primary. O. D. S.

Effect of X-rays on cuprous oxide barrier-layer photo-cells in vacuo. A. N. KRONHAUS (Physikal. Z. Sovietunion, 1936, 9, 461—465).—The sensitivity of a Cu₂O barrier-layer photo-cell to X-rays is decreased by placing the cell in vac. The sensitivity in vac. does not alter with time. O. D. S.

Building up the active layer of a cuprous oxide rectifier. F. WAIBEL (Wiss. Veröff. Siemens-Werken, 1936, 15, No. 3, 75—86).—A layer of Cu₂O on Cu was reduced in steps from original thickness of 300 μ to 35 μ , and the electrical properties of the steps were investigated. The sp. resistance of the Cu₂O decreased linearly from 10¹² ohms at 300 μ to 10⁹ ohms at 50 μ and then remained const. for smaller thicknesses to 35 μ . Voltage-current curves are given (—400 to 400 volts) for different thicknesses of Cu₂O. A. E. M.

Theory of the photo-electromotive force in semiconductors. L. LANDAU and E. LIFSCHITZ (Physikal. Z. Sovietunion, 1936, 9, 477—503).—The e.m.f. appearing in a circuit containing a semiconductor illuminated from one side is calc. for the two cases: (a) that conduction in the semiconductor is due to electrons, (b) that conduction is due to electrons and to holes behaving as positive electrons. O. D. S.

Effect of plastic deformation on the inner photo-effect in silver chloride single crystals. E. A. KIRILOV and A. M. POLONSKI (Physikal. Z. Sovietunion, 1936, 9, 100—101).—The photo-current increases by 5—7% with stretching forces of 80—100 g. per sq. mm. but decreases sharply to 30—50% of the original val. with forces > 300 g. per sq. mm. R. S.

Photo-electric conduction in rock-salt crystals under ultra-violet illumination. P. TARTAKOVSKI and V. PODDUBNI (Physikal. Z. Sovietunion, 1936, 9, 407—412; cf. A., 1936, 137).—The depolarisation current has been investigated of an NaCl crystal containing U centres and polarised by illumination by an Al spark. After the depolarisation current in ultra-violet light has fallen to a small val. a large current is again observed on illumination with visible light. The depolarisation current with visible light shows max. at 4550 and 4750 Å. It is deduced that the electrons forming the space charge are bound in two levels, the higher of which coincides with the I' level. O. D. S.

Photoconductivity in crystals. A. L. HUGHES (Rev. Mod. Physics, 1936, 8, 294—315).—A review, dealing chiefly with the production and properties of F and U centres in crystals. A. J. M.

Application of the Raman-Krishnan theory to dipole moment measurements by the dilute solution method. H. O. JENKINS and S. H. BAUER (J. Amer. Chem. Soc., 1936, 58, 2435—2438).—Theoretical objections to the theory are raised. E. S. H.

Dipole moments of vapours. III. Homologous series. L. G. GROVES and S. SUGDEN (J.C.S., 1937, 158—162).—By combining the measurements on the vapours of 20 substances with recorded data, the moments of the first four or five members of different homologous series have been obtained. Induction along the hydrocarbon chain does not completely explain changes in the val. of the moment on ascending a homologous series. Now dielectric matter introduced into the mol. may alter the distribution of the electric field around the dipole, and may influence the changes in moment $>$ induction. A comparison of some normal and branched-chain compounds supports this view. W. R. A.

Dielectric polarisation. XXI. Effect of solvent and temperature on the polarisation and apparent moments of bromides. E. G. COWLEY and J. R. PARTINGTON (J.C.S., 1937, 130—138).—The polarisations of EtBr and PhBr have been measured in various solvents at different temp. The vals. of the moment are $<$ those for the vapours, and for a given temp. the polarisations decrease as the dielectric const. of the solvent increases. Experimental data have been examined by solvent-effect equations and the agreement between calc. and observed vals. for the vapours is generally satisfactory. W. R. A.

Measurement of dielectric constants and absorption coefficients with short waves. V. I. ROMANOV (Physikal. Z. Sovietunion, 1936, 9, 362—382).—The determination of ϵ for liquids, using a condenser sealed into a small glass vessel and bridging a Lecher wire system, is described with special reference to errors arising from the relative positions of condenser and wire. L. G. G.

Accurate representation of refractive index of distilled water as a function of wave-length. L. W. TILTON (J. Res. Nat. Bur. Stand., 1936, 17, 639—650).—Mathematical. A crit. examination of Ketteler-Helmholtz dispersion equations for H_2O , and consideration of n to six decimal places. C. R. H.

Dispersion in ether vapour. M. LOMBERT (Physikal. Z. Sovietunion, 1936, 10, 1—9).—The refractive index of Et_2O vapour is shown to vary with the λ according to $n - 1 = 15,036 \times 10^{-7} \lambda^2 / (\lambda^2 - 915^2)$. R. S. B.

Rotatory dispersion of organic compounds. First oxidation product of ascorbic acid. W. C. G. BALDWIN (J.C.S., 1937, 125—127).—The rotatory dispersion and speed of mutarotation of the lactone (2:3-diketogulonolactone) formed as the first oxidation product of ascorbic acid and the

rotatory dispersion of the corresponding Na salt have been determined. W. R. A.

Solvent action. XII. Optical rotatory powers of *l*-benzoin and *l*-benzoin methyl ether in solution. H. G. RULE and J. CRAWFORD. **XIII. Optical rotatory power and the refractive index of the medium.** H. G. RULE and A. R. CHAMBERS (J.C.S., 1937, 138—145, 145—153).—I. *l*-Benzoin and *l*-benzoin Me ether were chosen for detailed study of optical properties, the former because it shows a marked tendency to associate and the latter because it exhibits very contrasted rotatory power in different solvents. α appears to depend to some extent on the n of the solvent but the effect may be masked by more pronounced polar effects. Low lævo-rotation of *l*-benzoin, characteristic of solutions in polar solvents, is sometimes observed in non-polar solvents and is attributed to self-association of the active mols. The temp. effect has been examined in polar solvents and with rising temp. vals. of α are displaced towards vals. usually found in non-polar solvents, in agreement with the association hypothesis.

II. For solutions of *d*-pinane the effect of solvent depends mainly on the n of the solvent; experimental data for non-polar solvents are in good agreement with calc. vals., but for polar solvents experimental vals. are $<$ calc. *d*-Pinene behaves like a polar compound and exhibits characteristic temp. effects in polar solvents. *d*-Limonene reveals anomalous behaviour in solvents of different n , and concn. changes in non-polar media suggest that this is attributable to association effects. W. R. A.

Optical studies with liquid helium II. L. V. SCHUBNIKOV and A. K. KIKOIN (Physikal. Z. Sovietunion, 1936, 10, 119—120).—The Kerr effect at 1.72° abs. and the effect on polarised light at 1.72—4.22° abs. have been studied with He II, with a view of determining whether liquid crystals are present. Results were negative, showing that the anisotropy of n is $< 7 \times 10^{-8}$. R. S. B.

Structure, energy content, and other properties of active substances. XIII. Structure of active substances. R. FRICKE (Ber., 1937, 70, [B], 138—146).—The relationship between energy content, lattice disturbance, and particle size is developed in the cases of cryst. α -FeO·OH, ZnO, BeO, MgO, and varieties of α -Fe₂O₃ and Hahn's emanation method is applied to the problem. It is shown that the structure and energy content of active oxides depend not only on the mode of prep. but also largely on the nature of the initial material. H. W.

Dissociation energy of carbon monoxide and the abundance of elements in stellar atmospheres. M. NICOLET (Nature, 1936, 138, 1097).—Of the many vals. recently proposed for the heat of dissociation of CO, only the val. $D(CO) = 9.1$ e.v. agrees with theory and observation concerning the composition of the atm. of late-type stars. L. S. T.

ψ -Halogenes. XXXIII. Electro-affinity of the hydroxyl group. J. GOUBEAU (Z. physikal. Chem., 1936, B, 34, 432—442; cf. A., 1936, 704).—From the lattice structure of LiOH the lattice energy has

been calc. to be 205, giving 76 kg.-cal. per mol. for the electro-affinity of OH. This latter val. gives for the lattice energies of NaOH, KOH, RbOH, and CsOH 176, 153, 147, and 136, respectively, and for the hydration energies of OH' and H' 88 and 260 kg.-cal. per mol., respectively. R. C.

Certain geometrical properties of the carbon tetrahedron. V. S. GUTIRIA (J. Gen. Chem. Russ., 1936, 6, 1488—1495).—Theoretical. R. T.

Predissociation of polyatomic molecules. F. DUSCHINSKI (Acta Physicochim. U.R.S.S., 1936, 5, 651—654).—A theoretical discussion. F. L. U.

Recombination velocity of free atoms. E. RABINOWITCH (Trans. Faraday Soc., 1937, 33, 283—293).—The high efficiency of triple collisions in the recombination of H, Br, and I atoms is pointed out, and it is suggested that no "statistical factor" should be applied to restrict the possible no. of successful triple collisions. The no. of triple collisions is shown to depend on the sum $\tau_{AA} + \tau_{AX}$ where τ_{AA} and τ_{AX} are the periods of the collisions AA and A + X, respectively, A being the recombining atom and X a third body. These sums are estimated by comparing "uncorr." mol. diameters with those calc. by Sutherland's formula. Comparison of the calc. and experimental recombination velocities shows that in presence of N₂, O₂, CH₄, or CO₂ as third body every three-particle collision leads to reaction, but the efficiency is smaller in presence of H₂, He, or A, whilst it is > expected in presence of C₆H₆. Combination with sound dispersion and resonance fluorescence data shows easy conversion of vibrational energy into translational energy by collision when strongly vibrating mols. are involved. The long life of active N does not demand that the recombination of N atoms is much slower than that of H, Br, and I atoms. J. W. S.

Transfer of energy in molecular systems. H. GERSHINOWITZ (J. Chem. Physics, 1937, 5, 54—59).—Problems of energy transfer in mol. systems are discussed with the aid of the potential energy surface previously described (A., 1936, 162). The probability of energy transfer (reactivity) is now shown to be related to the bending of the equipotential lines and consequently is dependent on the state of excitation of the reacting bodies. The inverted order of efficiencies of the rare gases in energy transfer processes, determined by sound dispersion methods and by kinetic measurements, respectively, is similarly explained. W. R. A.

Effect of ionic forces shown by the liquid structure of alkali halides and their aqueous solutions. G. W. STEWART (Trans. Faraday Soc., 1937, 33, 238—247; cf. A., 1934, 721).—Consideration of the densities of solid and liquid alkali halides, and of their m.p. and b.p., leads to the conclusion that the forces responsible for the cryst. state are still to some extent effective in the liquids. Data concerning the apparent mol. vols. in aq. solution are interpreted in the sense that the ions, particularly the alkali-metal ions, affect the structure of H₂O at distances > the ionic radii. F. L. U.

Theory of molecular forces. F. LONDON (Trans. Faraday Soc., 1937, 33, 8—26).—Recent theoretical developments are discussed and deductions from them are compared with experimental results. F. L. U.

Molecular theory of liquid structure. J. D. BERNAL (Trans. Faraday Soc., 1937, 33, 27—40).—Some fundamental properties of liquids are shown to be deducible from a theory based on the possibility of expressing the state of a liquid under any conditions in terms of three variables only. F. L. U.

Energy bands for the face-centred lattice. W. SHOCKLEY (Physical Rev., 1937, [iii], 51, 129—135).—Detailed solutions, using the Slater method of obtaining wave functions (cf. A., 1934, 828), are obtained. N. M. B.

Determination of the activity of the solid phase. N. F. LASCHKO and B. G. PETRENKO (Ukrain. Chem. J., 1936, 11, 342—347).—The free energies of oscillating atoms in a given and a standard state are calc.; their relation is the activity coeff. J. J. B.

Determination of the electrical and geometrical structure of molecules. P. DEBYE (Angew. Chem., 1937, 50, 3—10).—Nobel lecture. Available methods and the data so obtained are discussed and compared. C. R. H.

Atomic forces of the solid state. IV. W. WEN-PO (Phil. Mag., 1937, [vii], 23, 33—49; cf. A., 1936, 1052, 1185).—Theoretical. The thermal properties of solids are dealt with, and the theory is extended to the liquid state. A. J. E. W.

Intensity of orbital interaction in salts. Ion factor. R. FORRER (Compt. rend., 1936, 203 1530—1532).—Previous theory (this vol., 71) is extended to consideration of the ions in a crystal lattice. Vals. of the const. *F* for the ions considered are equal to extrapolated vals. for the metals with no electrons in the incomplete outer electronic shells. A. J. E. W.

Parachor expression independent of surface tension. J. F. DURAND and R. LAUTIE (Bull. Soc. chim., 1937, [v], 4, 72—78).—The parachor of a liquid of mol. wt. *M* and abs. density *D_c* at its abs. b.p. *T_c* can be expressed by $\times 10^{-4}(388 \log T_c + 12,982 + 6337T_c \times 10^{-2} - 588T_c^2 \times 10^{-5})$. For 27 substances the formula gives results concordant with those obtained using Sugden's relation. The formula is useful when the determination of surface tension is difficult. E. S. H.

Surface tensions, densities, free surface energies, and parachors of derivatives of benzylated phenols. D. T. EWING and F. W. LAMB (J. Amer. Chem. Soc., 1936, 58, 2454—2456).—Data for 13 compounds are recorded. E. S. H.

Elimination of systematic errors in powder photographs. M. V. COHEN (Z. Krist., 1936, 94, 288—298).—A method is described whereby in precise powder measurements systematic errors can be eliminated, giving a result depending only on the λ val. adopted for the X-rays. B. W. R.

Calculation of precise lattice constants from X-ray photographs. M. V. COHEN (Z. Krist., 1936, 94, 306—310).—A discussion of the best methods of

calculation for the elimination of systematic error (cf. preceding abstract). B. W. R.

Strengthening of weak, and spurious appearance of forbidden, X-ray reflexions by "indirect" excitation. M. RENNINGER (Naturwiss., 1937, 25, 43).—The intensity of the forbidden (222) reflexion for diamond depends on the incidence azimuth. Max. occur at such azimuths where a subsidiary accompanies the principal reflexion. This is due to an "indirect" excitation, and it is possible to explain the occurrence of a no. of "forbidden" reflexions for the diamond in this way. A. J. M.

Scattering of X-rays at neon-like molecules and at benzene. G. THOMER (Physikal. Z., 1937, 38, 48—57).—The scattering of Cu $K\alpha$ rays in Ne, H_2O , NH_3 , and CH_4 has been examined. In this series there is an increasing loosening of the close Ne electron configuration with increasing no. of H. The charge distribution of the above hydride mols. may be explained by assuming them to be centre-symmetrical like Ne. The scattering in C_6H_6 vapour was investigated, and the effect of H atoms and the change in the charge distribution due to C-C linkings on the scattering curve are discussed. A. J. M.

What X-rays can do for industry. V. HICKS (Physics, 1936, 7, 79—84).—A survey of the application of X-ray diffraction in industrial analysis. L. G. G.

Surface temperature of rubbing solids and the formation of the Beilby layer. F. P. BOWDEN and T. P. HUGHES (Nature, 1937, 139, 152).—Examples in which surface flow, polish, and formation of the Beilby layer readily occur on metals, crystals, and glasses, if the m.p. of the polisher is $>$ that of the solid polished, are described. The relative hardness as normally measured at room temp. is comparatively unimportant. Intense local heating at the points of contact is an important part of the process of polishing. L. S. T.

Crystallisation of thin layers of supercooled liquids. F. K. GORSKI (Physikal. Z. Sovietunion, 1936, 9, 89—93).—The rate of formation of crystallisation centres N_{max} in supercooled piperine and *o*-nitrophenol is given by $N_{max} = (c/w)^2$ where c is the probability of formation of centres and w is the linear rate of crystallisation. N_{max} is a max. at 0° and at 20° whilst c is the same in each case. The max. is displaced towards lower temp. by the application of an electric field. This effect, and the influence of impurities, are attributed to a change in the interfacial energy. R. S.

Statistical investigation of the structure [of metals]. II. Measurement of the volume of crystals. E. SCHEIL and H. WURST (Z. Metall., 1936, 28, 340—343).—The area of a no. of individual grains in a polished section of the metal is measured and the measurements are repeated on the same crystals after polishing away 3—4 thicknesses of about 0.008 mm. From these results frequency curves of grain-size are constructed from which the mean grain-size can be deduced. A. R. P.

Crystallisation of supercooled sulphur in an electric field. V. V. KONDOGURI (Physikal. Z. K (A., I.)

Sovietunion, 1936, 9, 603—612).—The variation with temp. from 20° to 100° of the no. of crystallisation centres formed in supercooled S has been investigated. A max. val. was observed at 55° and a min. at 30° . The no. of centres formed is increased by the application of an electric field perpendicular to the glass surface confining the drop, and decreased by a field parallel to the surface. O. D. S.

Development of crystal analysis. (SIR) W. BRAGG (J. Soc. Arts, 1937, 85, 228—241).—A lecture.

Determination of structure in liquids by X-ray methods. J. T. RANDALL (Trans. Faraday Soc., 1937, 33, 105—109).—A discussion of recent work. F. L. U.

Debye-Scherrer exposures of liquid helium. W. H. KEESOM and K. W. TACONIS (Physica, 1937, 4, 28).—He I and He II gave a liquid-type ring, that of He II being the wider. The deviation angles are: He II 27.5° , He I 24° (Cu $K\alpha$ rays). N. M. B.

Structure of crystalline bromine. B. VONNEGUT and B. E. WARREN (J. Amer. Chem. Soc., 1936, 58, 2459—2461).—X-Ray evidence at -150° gives a 4.48, b 6.67, c 8.72 Å. The structure is isomorphous with that of I and shows a Br_2 mol. with Br—Br distance 2.27 ± 0.10 Å. E. S. H.

Crystal structure of β -titanium. W. G. BURGERS and F. M. JACOBS (Z. Krist., 1936, 94, 299—300).—Above 900° Ti has a cubic body-centred structure, 2 atoms in cell, a_0 3.32 Å. B. W. R.

Identity of structure in liquid lead and bismuth. J. T. RANDALL and H. P. ROOKSBY (Trans. Faraday Soc., 1937, 33, 109—110).—The X-ray patterns of liquid Pb and Bi are identical. The calc. "spacings" are 2.95 Å. for each. F. L. U.

Laue patterns from bent sodium chloride crystals. A. P. KOMAR (Physikal. Z. Sovietunion, 1936, 9, 97—99).—The theoretical and experimental Laue patterns coincide and it is inferred that the crystal behaves as a mosaic aggregate of blocks which change their orientation nearly independently. R. S.

Structure of plastically deformed crystals according to Laue patterns. I. A. P. KOMAR. II. Plastically extended single crystals of magnesium. A. P. KOMAR and M. MOCHALOV (Physikal. Z. Sovietunion, 1936, 9, 413—432, 613—617).—I. Theoretical. Laue patterns constructed for circularly bent NaCl crystals by a graphical-analytical method are in agreement with those obtained experimentally.

II. The Bragg reflexions of the Mo $K\alpha$ radiation from the (0001) plane of a single crystal of Mg plastically extended by 10% have an angular width of 3° . The experimental Laue diagram for the same crystal is identical with that calc. on the assumption that this angular width corresponds with a macroscopic curvature of the gliding plane of the deformed crystal. O. D. S.

Structure, heat content, and special properties of active substances. XII. Structure and heat content of γ -ferric oxide prepared in different ways, and the heat of formation of lepidocrocite (γ - $FeO \cdot OH$). R. FRICKE and W. ZERRWECK (Z. Elektrochem., 1937, 43, 52—65).—The heat content

of Fe_2O_3 varies considerably with the source from which it is prepared; that from synthetic $\gamma\text{-FeO}\cdot\text{OH}$ is $>$ that from mineral $\gamma\text{-FeO}\cdot\text{OH}$, which is $>$ that from Fe_3O_4 . The structure of Fe_2O_3 , as shown by X-rays, also varies with the method of prep., although there is no essential change in the lattice. The particle size of the product is influenced by that of the parent substance. E. S. H.

X-Ray investigations with manganous oxide. (MME.) B. RUHEMANN (Physikal. Z. Sovietunion, Spec. no., June, 1936, 91—106).—The lattice const. a of MnO varies from 4.4345 ± 0.0005 Å. at 290° abs. to 4.4260 ± 0.0005 Å. at 95° abs. The coeff. of expansion is const. at -1.45×10^{-5} between room temp. and 175° abs. and then decreases. Below the λ -point (115.9° abs.) a second lattice const., a' , appears of magnitude $10 X < a$; it is in equilibrium with a over a wide temp. range. At 77° abs. only the a' lattice exists, and this is not strictly cubic. J. W. S.

Crystal structure of Mn_3Si_3 . K. AAMARK, B. BORÉN, and A. WESTGREN (Svensk Kem. Tidskr., 1936, 48, 273—276; cf. A., 1935, 23).—The results of Vogel and Bedarff (A., 1934, 482) have been confirmed. M. H. M. A.

Valency angle of bivalent lead. Crystal structure of ammonium, rubidium, and potassium pentabromodiplumbites. H. M. POWELL and H. S. TASKER (J.C.S., 1937, 119—123).—The constitution of compounds of the type MPb_2Br_5 ($M = \text{NH}_4, \text{K}, \text{Rb}$) determined by X-ray analysis shows them to be isomorphous. The space-group is $I4/mcm$. The structures consist of vertical chains of MBr separated by PbBr_2 mols. which are arranged around them. PbBr_2 is a bent mol. with a valency angle of about $85\frac{1}{2}^\circ$. W. R. A.

Stereochemistry of bivalent tin and lead. E. G. COX, A. J. SHORTER, and W. WARDLAW (Nature, 1937, 139, 71—72).—X-Ray examination of several derivatives of Sn^{++} and Pb^{++} , such as $\text{K}_2[\text{SnCl}_4]\cdot 2\text{H}_2\text{O}$, a 12.02, b 9.11, c 8.23 Å., space-group $Pnma$, 4 mols. per unit cell: $\text{PbCl}_2\cdot 2\text{CS}(\text{NH}_3)_2$, a 20.67, b 3.99, c 11.98 Å., space-group Pna ; and Pb bisbenzoylacetone, a 23.41, b 7.77, c 9.96 Å., space-group Pcn , shows that the configuration is planar, and since Sn^{++} and Pb^{++} are known to possess a tetrahedral disposition of bonds, the results support the view that the principal valency determines the arrangement of the atoms. L. S. T.

Structure of uranium pyrophosphate, UP_2O_7 . G. PEYRONEL (Z. Krist., 1936, 94, 311—312).—This substance has the same structure type as the corresponding Si , Ti , etc. compounds. Space-group $P6_3$, a_0 8.61 Å. B. W. R.

Crystal structure of $\text{Zn}(\text{NH}_3)_2\text{Cl}_2$ and $\text{Zn}(\text{NH}_3)_4\text{Br}_2$. C. H. MACGILLAVRY and J. M. BIJVOET (Z. Krist., 1936, 94, 249—255).—The cell consts. are a 7.78, b_0 8.50, c_0 8.08 Å., and a_0 8.12, b_0 8.81, c_0 8.41 Å., respectively; space-group is $Imam$ for both. At. parameters are determined, and as with the diammine compounds previously investigated, the lattice resembles the CsCl pattern. B. W. R.

Crystal lattice of heteropoly-acids and their salts. III. Isomorphy and structural relations among the higher hydrates of heteropoly-compounds. O. KRAUS (Z. Krist., 1936, 94, 256—279).—An X-ray investigation is made of the following compounds: $\text{ThSiW}_{12}\text{O}_{40}\cdot 27$ and $30\text{H}_2\text{O}$, $\text{Ca}_2\text{SiW}_{12}\text{O}_{40}\cdot 26\text{H}_2\text{O}$, $\text{Ba}_2\text{SiW}_{12}\text{O}_{40}\cdot 24\text{H}_2\text{O}$, $\text{Zn}_2\text{SiW}_{12}\text{O}_{40}\cdot 27\text{H}_2\text{O}$, $\text{Cu}_2\text{SiW}_{12}\text{O}_{40}\cdot 27\text{H}_2\text{O}$, $\text{Li}_2\text{SiW}_{12}\text{O}_{39}\cdot 27$ and $24\text{H}_2\text{O}$ (some doubt about the exact formula), $\text{K}_4\text{SiW}_{12}\text{O}_{40}\cdot 18\text{H}_2\text{O}$, $\text{K}_5\text{BW}_{12}\text{O}_{40}\cdot 18\text{H}_2\text{O}$, $\text{H}_3\text{PW}_{12}\text{O}_{40}\cdot n\text{H}_2\text{O}$, the lattice consts. and space-groups being determined. Optical anomalies in the behaviour of the first compound are related to the structure. A general summary and comparison of the lattices and structures of compounds of these types is made, and their isomorphy discussed in detail; the size of the cation is often the determining factor in the structure class to which the substance belongs. B. W. R.

Constitution of lead oxide-silica glasses. I. Atomic arrangement. G. J. BAIR (J. Amer. Ceram. Soc., 1936, 19, 339—347).—X-Ray examination of a series of glasses (28—85% PbO) showed their structure to be a random orientation of Si-O tetrahedra and Pb atoms. There is no crystallite formation and increase in PbO content causes no sudden change in at. arrangement. J. A. S.

Crystal structure of the paraffin-carbon choleic acids. O. KRATKY and G. GIACOMELLO (Monatsh., 1936, 69, 427—436).—A model is suggested which explains the stepwise increase in co-ordination no. of the acids $\text{C}_n\text{H}_{2n}\text{O}_2$ with increasing length of the hydrocarbon chain. J. W. S.

Structure of glycine. A. KITAIGORODSKI (Acta Physicochim. U.R.S.S., 1936, 5, 749—755).—X-Ray examination of glycine confirms the conclusions of Hengstenberg and Lenel (A., 1931, 790) with regard to the form and dimensions of the unit cell, but not with regard to the at. co-ordinates. A revised structure is proposed. F. L. N.

Scattering of X-rays in halogenated benzenes. R. SCHOPPE (Z. physikal. Chem., 1936, B, 34, 461—470).—Scattering measurements have been used to determine interat. distances in di- and tri-halogenobenzenes. In Cl-derivatives the distance between Cl in the o -position is $>$ corresponds with a regular arrangement, apparently owing to deformation of the electron envelopes. R. C.

X-Ray crystallography and the chemistry of steroids and sex hormones. D. CROWFOOT and J. D. BERNAL (Chem. Weekblad, 1937, 34, 19—22).—A lecture. S. C.

X-Ray investigation of sericin. Y. MATSUNAGA (J. Soc. Chem. Ind. Japan, 1936, 39, 465B).—Various samples of sericin gave similar X-ray photographs indicating a cryst. structure, except Mosher's sericin-A which had a different pattern. The H_2O content had little effect on the positions of the rings. A. G.

Intensity distribution in Debye rings due to various fibre structures. I. General theory. II. Spiral fibre structures of cellulose and fibroin fibres. C. MATANO (J. Soc. Chem. Ind. Japan, 1936, 39, 478—481B, 481—483B).—I. A

general equation is worked out for the intensity distribution of reflected X-rays, and applied to a random orientation of micelles and to simple, spiral, and ring fibre structures.

II. The equation is applied to cellulose and fibroin for simple, spiral, and ring fibre structures and the results are compared with photographs of ramie and of degummed silk.

A. G.

Determination of the inner potential of crystals from electron diffraction. S. KALASCHNIKOV (Physikal. Z. Sovietunion, 1936, 9, 81—88).—The Bragg formula has been modified, taking account of the phase-jump of the ψ -wave. The asymptotic increase of the equiv. potential can be accounted for on this basis.

R. S.

Electron diffraction by gas molecules. L. O. BROCKWAY (Rev. Mod. Physics, 1936, 8, 231—266).—A review of the theory and technique of electron diffraction by gas mols. with a summary of results.

A. J. M.

Diffraction by amorphous substances. J. A. PRINS (Trans. Faraday Soc., 1937, 33, 110—112).—Spacings for liquid Wood's metal, Sn, Bi, Se, and S are given. The general interpretation of diffraction patterns of amorphous substances is discussed, and it is emphasised that the only information obtainable from them is the distribution law for intermol. distance.

F. L. U.

Electron diffraction photograph of a random arrangement of "cross-grating crystallites." W. G. BURGERS (Z. Krist., 1936, 94, 301—305).—An electron diffraction photograph of a rolled and etched Ni-Fe sample is shown to correspond with a random cross-grating lattice of the type discussed by von Laue (A., 1932, 681).

B. W. R.

Electron-optical observation of metal surfaces. I. Iron: formation of the crystal pattern on activation. II. Phenomena observed on transition of α - into γ -iron. W. G. BURGERS and J. J. A. P. VAN AMSTEL (Physica, 1937, 4, 5—14, 15—22).—I. Emission photographs are given for the evaporation, diffusion, disactivation, and reactivation stages of Fe activated by a layer of Sr + SrO deposited in the evacuated electron microscope from a W spiral covered with SrCO₃ suspension. Crystal patterns and process mechanism over a temp. range 800—1500° are discussed.

II. Photographs for the changes in the emission patterns of Fe for α \rightarrow γ transitions are given, and are discussed in relation to metallography and electron emission. A zone of temporarily abnormal emission in front of a growing crystallite indicates that the transition process is accompanied by a migration of activating atoms in the growing zone.

N. M. B.

Examination of passive iron by electron diffraction. I. IITAKA, S. MIYAKE, and T. IMORI (Nature, 1937, 139, 156).—Films detached from the surface of electrolytic Fe made passive by immersion in K₂CrO₄ solution are composed of γ -Fe₂O₃ or Fe₃O₄. The films are ferro-magnetic and chemical tests indicate γ -Fe₂O₃ in preference to Fe₃O₄. Films detached from non-passive Fe polished in air are also γ -Fe₂O₃. No diffraction rings were observed

and no film could be detached from Fe made passive in conc. HNO₃.


L. S. T.

Diffraction of slow electrons by zinc single crystals. S. G. KALASCHNIKOV and I. A. JAKOVLEV (Physikal. Z. Sovietunion, 1936, 9, 13—26).—8 diffraction max. are recorded for electron velocities between 6 and 140 volts at a const. angle of incidence of 15°. Changes in surface conditions with rise of temp. do not affect the position of the max., which arise from the lattice structure, but the intensity diminishes.

R. S.

Surface structure of silicon carbide. G. I. FINCH and H. WILMAN (Trans. Faraday Soc., 1937, 33, 337—339).—The electron diffraction halo pattern obtained with carborundum crystals is due to a surface film, probably amorphous SiO₂. After removal of the film by abrasion or etching, brilliant single-crystal patterns are obtained. The film, reformed by heating in an oxidising flame, may be so thin as to be semi-transparent to 50-kv. electrons. This fact, and the observation that a unimol. film of C₃₂H₆₆ is not penetrated by these electrons at grazing incidence, indicate that the thickness of the semi-transparent film is < 43 Å.

J. W. S.

Structure of pentaborane, B₅H₉. S. H. BAUER and L. PAULING (J. Amer. Chem. Soc., 1936, 58, 2403—2407).—Electron diffraction data indicate the structure BH₂——B-BH₃, the last B atom being coplanar with the four-membered ring. Measured interat. distances are: B-B 1.76±0.02 Å., B-H 1.17±0.04 Å.

E. S. H.

Adjacent charge rule and the structure of methyl azide, methyl nitrate, and fluorine nitrate. L. PAULING and L. O. BROCKWAY (J. Amer. Chem. Soc., 1937, 59, 13—20).—In accordance with the rule (A., 1933, 1222), electron-diffraction investigation leads to configurations of the mols. corresponding in each case with resonance between two important valency-linking structures. The differences between chemical properties of covalent and ionic azides and nitrates are correlated with differences in structure.

E. S. H.

Molecular structures of the Δ^2 -butenes and the $\beta\gamma$ -epoxybutanes. L. O. BROCKWAY and P. C. CROSS (J. Amer. Chem. Soc., 1936, 58, 2407—2409).—Electron diffraction data give the following identification of the isomeric forms and mol. sizes: Δ^2 -butene, *cis* (b.p. 3.0°) C-C 1.54±0.03 Å., C-C 1.38±0.03 Å., *trans* (b.p. 0.3°) C-C 1.56±0.04 Å., C-C 1.40±0.04 Å.; $\beta\gamma$ -epoxybutane, *cis* (b.p. 54°) C-C 1.54±0.03 Å., C-O 1.43±0.03 Å., *trans* C-C 1.54±0.03 Å., C-O 1.43±0.03 Å.

E. S. H.

C-N linking in methyl cyanide [acetonitrile] and methyl isocyanide. L. O. BROCKWAY (J. Amer. Chem. Soc., 1936, 58, 2516—2518).—Electron diffraction data give the following interat. distances (in Å.): Me-C 1.54±0.02, C-N 1.16±0.02; Me-N 1.48±0.03, N-C 1.17±0.02. A triple linking exists in the CN group of each compound. Both compounds are linear, except for H.

E. S. H.

Hall effect in nickel in the neighbourhood of the Curie point. I. K. KIKOIN (Physikal. Z.

Sovietunion, 1936, 9, 1—12).—The Hall effect c.m.f. varies linearly with the magnetisation at different temp. and becomes very small at the Curie point, but the Hall coeff. R_H shows no sharp change here.
R. S.

Definition of the Curie point. A. KUSSMANN and A. SCHULZE (Physikal. Z., 1937, 38, 42—47).—A comparison of the magnetisation-temp. curves for small fields with the resistance-temp. curves of ferromagnetic substances (Ni, and its alloys with Cu, Cr, Si, Al, W, Co, and Fe) shows that the Curie point obtained from the max. of the temp. coeff. of resistance does not correspond with the temp. at which ferromagnetism disappears. This discrepancy is due to inhomogeneity. The Curie point is a sharply defined temp. for a homogeneous substance, and not a "region."
A. J. M.

Ferromagnetic anisotropy in nickel-cobalt-iron crystals at various temperatures. L. W. McKEEHAAN (Physical Rev., 1936, [ii], 51, 136—139).—Results of investigations at room temp., 200°, and 400° on single crystals of ternary alloys, all face-centred cubic, containing <40% Ni are reported and discussed in relation to composition. Data for binary alloys and single components are recalled.
N. M. B.

Ferromagnetic anisotropy at various temperatures of (A) iron crystals. R. G. PIETY. (B) Nickel-iron crystals. J. D. KLEIS (Physical Rev., 1936, [ii], 50, 1173—1177, 1178—1181).—(A) Magnetisation curves in important crystallographic directions are obtained for small oblate spheroids cut from H-free Fe crystals, and ferromagnetic anisotropy is compared with available data.

(B) Similar curves at temp. up to near the Curie point are obtained for Ni-10—50% Fe annealed face-centred cubic crystals. A change in ferromagnetic anisotropy at about 24% Fe is found.
N. M. B.

Heat effect in the magnetic transformation of nickel. H. VON STEINWEHR and A. SCHULZE (Z. Metallk., 1936, 28, 347—349).—Measurements made on a 26.7 kg. mass of 99.1% Ni showed that a heat evolution of 0.65 g.-cal. per g. occurs during the magnetic transformation at 333—362°. A small evolution of heat was also found at about 100° below the Curie point.
A. R. P.

Variation of the internal friction and elastic constants with magnetisation in iron. I. W. T. COOKE. II. W. F. BROWN, jun. (Physical Rev., 1936, [ii], 50, 1158—1164, 1165—1172).—I. A new precision method is used for measuring the variation of Young's modulus and the longitudinal coeff. of internal friction of annealed and unannealed Armco Fe with magnetisation at room temp. Data describing the behaviour of the Fe in three different magnetic states are obtained.

II. Observed coeffs. of internal friction are corr., and the variation of torsional decrement with magnetisation is measured. Formulae for contributions to the moduli and decrements arising from eddy currents are deduced. Magnetostriction and Wiedemann effect coeffs. are obtained, and all eddy

current effects are eliminated from final data. Interpretations are discussed.
N. M. B.

Latent energy and residual tension of plastic deformed rock-salt. A. I. GARBER (Physikal. Z. Sovietunion, 1936, 9, 111—131).—The latent energy of deformed rock-salt has been studied by means of temp. measurements, and the residual tension by means of polarised light.
R. S. B.

Dependence on temperature of cathode sputtering. N. D. MORGULIS, M. P. BERNADINER, and A. M. PATIOCHA (Physikal. Z. Sovietunion, 1936, 9, 302—316).—Measurements were made with thoriated W in Hg vapour between 1350° and 1750° abs., and with W in Hg vapour between 800° and 2000° abs. Sputtering varied little with temp. of cathode.
A. E. M.

Kinetic basis of crystal polymorphism. M. J. BUEGER (Proc. Nat. Acad. Sci., 1936, 22, 682—685).—A kinetic explanation of polymorphism is sought in the relations between the symmetry of the possible vibration modes of the structure units, or "clusters," and the geometrical symmetry of the structure itself. For a given kinetic energy input, i.e., temp., there will be a preferred cluster vibration mode and the crystal will tend to adjust its symmetry to include the dynamic symmetry of this mode. Possible tests of this idea are (1) comparison of thermodynamic and crystal data for polymorphous substances, (2) correlation of emitted frequencies at high temp. with Raman and absorption frequencies.
B. W. R.

General rôle of composition in polymorphism. M. J. BUEGER (Proc. Nat. Acad. Sci., 1936, 22, 685—689).—The polymorphism of a phase *A* is affected by a change of its composition, e.g., the formation of a solid solution of a contained impurity *B*. The direction of migration of the transformation point is indicated by an appropriate form of Le Chatelier's rule, the most important criterion being the room required or provided by the atoms of *B* as they form one or other of the possible types of solid solution.
B. W. R.

Influence of mechanical deformation on the velocity of transition of polymorphic metals. III. Influence of metallic impurities. II. E. COHEN and A. K. W. A. VAN LIESHOUT (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1174—1179; cf. A., 1936, 672).—Presence of 0.1% of Zn, Co, Mn, Al, or Te greatly increases the velocity of transition of white Sn. Fe, Ni, and Cu have practically no effect, whilst Bi, Sb, Pb, Cd, Au, and Ag diminish it. Simultaneous addition of traces of Al and Bi leads to compensation of the respective effects of the two metals.
J. W. S.

Inorganic complex compounds of boron trifluoride. L. J. KLINKENBERG (Chem. Weckblad, 1937, 34, 23—25).—A discussion of isomorphism of various derivatives of BF₃ with compounds in adjacent groups of the periodic system and its bearing on the Seifert diagonal relation. Alkali and TI borofluorides are isomorphous with the corresponding salts of HClO₄, K, Rb, Cs, NH₄, and TI borofluoride having a "baryta" structure, and NaBF₄ and

the isomeric NaClO_4 an "anhydrite" structure. X-Ray examination and measurement of the dissociation pressures at 400—700° show that $\text{NaOH} \cdot \text{BF}_3$ is a compound distinct from NaBF_4 . S. C.

Polymorphism of Rochelle salt. H. VON R. JAFFE (Physical Rev., 1937, [ii], 51, 43—47; cf. Mueller, A., 1935, 288).—An analysis of physical properties indicates that the crystal belongs to the monoclinic hemimorphic class between the Curie points 23.7° and -18°, regarded as crystallographic inversion points. Observed dielectric anomalies must be expected near inversions from pyroelectric to non-pyroelectric form. At other temp. the crystal is orthorhombic hemihedric. Electro-optic effect, converse and direct piezo-electric effect, and sp. heat are discussed in the light of the new classification.

N. M. B.

Electrical resistivity of single crystals of some dilute solid solutions in zinc. H. E. WAY (Physical Rev., 1936, [ii], 50, 1181—1185).—Sets of single crystals were grown of binary alloys consisting of dil. solid solutions of Cd, Cu, Ag, Au, Ni, and Fe, each in Zn. Electrical resistivities at 20° are expressed in terms of principal resistivities ρ_0 and ρ_{90} . The resistance increases non-linearly, in a given series of alloys, with increasing concn. The initial increase above that of pure Zn in micro-ohm-cm. per at.-% of solute is: Cd 0.94, Cu 0.4, Ag 1.1, Au 2.3, Ni 51.0, Fe 300.0. This is correlated with the nearness of solute metal to Zn in the periodic table. Temp. coeffs. decrease in agreement with Mathiessen's law.

N. M. B.

Resistance of palladium and palladium-gold alloys. J. G. G. CONYBEARE (Proc. Physical Soc., 1937, 49, 29—37).—Measurements of resistances, tabulated over 90—1250° abs. for Pd and four Pd-Au alloys, show that the variation of resistance with temp. resembles that of constantan for alloys up to about 60 at.-% Au, where there is a change to the normal type of curve. Results agree with Mott's application to the transition metals of the quantum mechanical theory of conductivity.

N. M. B.

Electrical conductivity of thin metallic films.
I. **Rubidium on Pyrex glass surfaces.** A. C. B. LOVELL (Proc. Roy. Soc., 1936, A, 157, 311—330).—The resistivity of thin films of Rb deposited on cooled Pyrex surfaces by a defined at. beam has been measured. Results consistent to 2 or 3% have been obtained. The presence of traces of impurity on the substrate leads to anomalous results. Conductivity has been observed with films 1 Å. thick. The decay of conductivity with time after cessation of the deposition decreased with increasing film thickness and with decreasing deposition temp. At 64° abs. the decay was negligible at a thickness of 25 Å. Films of thickness >40 Å. were so stable that their temp. coeffs. could be determined. Films 90 Å. thick were still invisible, but obeyed Ohm's law up to c.d. of 10⁶ amp. per cm.² The results are explained by a modification of Thomson's theory of the increase in resistance to be expected when the film thickness is < the normal electronic mean free path in the bulk metal.

L. L. B.

Bismuth crystals. III. Thermal and electrical conductivity in the transition from transverse to longitudinal magnetic field. E. GRUN-EISEN and J. GIELESSEN (Ann. Physik, 1937, [v], 28, 225—239; cf. A., 1936, 1329).—The heat (k) and electrical conductivity (κ) of Bi \perp and Bi \parallel crystals have been measured in transverse and longitudinal magnetic fields from 650 to 6100 oersted. For Bi \parallel the effect of magnetic field in transverse field is > in longitudinal. For Bi \perp at low field strengths the effect is a min. in transverse and a max. in longitudinal field; at high field strengths the effect is a min. in longitudinal field and a max. between transverse and longitudinal fields. The change in k is < that in κ for both crystals. k is affected by field reversal.

O. D. S.

Measurement of the resistance of boron and of silicon carbide. F. P. HENNIGER (Ann. Physik, 1937, [v], 28, 245—263).—The resistance of B (99.7% pure) is very high at low p.d. and decreases with increasing p.d., the heating current through the crystal being kept const. By application of p.d. up to 20 kv. at temp. from 20° to 400° the resistance is reduced from 30,000 to 200 ohms. It then remains const. from 2 to 20 volts and decreases at higher p.d. The temp. coeff. of the resistance of untreated B is very high but becomes small after treatment. The sp. resistance of one sample with const. resistance from 26 to 37 kv. is 0.25 ohm-cm. in this region. Si carbide shows similar variations in resistance which are due to the presence of badly conducting layers in the crystal.

O. D. S.

Thermomagnetic properties of nickel wire. III. W. BAND (Proc. Physical Soc., 1937, 49, 14—16).—Results previously reported (cf. A., 1936, 277) are analysed in detail.

N. M. B.

Magnetic moment of the proton. B. G. LASAREV and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, 1936, 10, 117—118).—The magnetic susceptibility (χ) of H_2 has been studied at 1.78°, 2.18°, and 4.22 abs., giving the vals. $\chi_{1.78}/\chi_{2.18} = 0.941$, $\chi_{1.78}/\chi_{4.22} = 0.886$, and $\chi_{2.18}/\chi_{4.22} = 0.942$. The magnetic moment of the proton is calc. to be 2.3 ± 0.2 nuclear magnetons.

R. S. B.

Particle size and magnetic susceptibility. S. S. BHATNAGAR, M. R. VERMA, and M. ANWAR-UL-HAQ (Kolloid-Z., 1937, 78, 9—18; cf. A., 1935, 1063).—The susceptibility (χ) of Pb, Cu, S, Se, Te, Sb, and Bi of particle size about 0.4 μ . does not differ from that of the respective elements in a compact form, contrary to the conclusions of Rao (A., 1936, 1190). Differences may be observed due to change of microcryst. form, or to the presence of included impurities.

F. L. U.

Magnetic properties of superconducting metals and alloys. L. V. SCHUBNIKOV, V. I. CHOTKEVITSCH, J. D. SCHEPELOV, and J. N. RJABININ (Physikal. Z. Sovietunion, Spec. no., June, 1936, 39—66).—The intensity of field required to destroy the superconductivity of polycryst. and monocryst. Pb, monocryst. Sn, polycryst. Hg, and Pb-Bi, Pb-Tl, Pb-In, and Hg-Cd alloys has been determined for various temp.

J. W. S.

Rare-earth elements in a metal lattice. V. I. DROSHINA and R. I. JAANUS (Physikal. Z. Sovietunion, 1936, 9, 72—80).—The relation between the reciprocal of the magnetic susceptibility of Ce and Pr and abs. temp. is linear. The Curie temp. are 6° and 2° abs. and the magnetic moments 11.4 and 16.0 M_W , respectively. Magnetic moments have been calc. for Ce and Pr in different degrees of ionisation and comparison shows that the metal lattices consist of Ce^{III} and Pr^{III} . R. S.

Magnetic susceptibility of metallic cerium. L. F. VERESCHTSCHAGIN, L. V. SCHUBNIKOV, and B. G. LASAREV (Physikal. Z. Sovietunion, Spec. no., June, 1936, 107—110).—The magnetic susceptibility (χ) of Ce has been measured at 2815, 4545, and 6195 gauss, and between 20.4° and 290° abs. χ does not follow the Curie-Weiss law, especially at lower temp. Divergencies from the results of Droshina and Jaanus (see preceding abstract) are explained by the latter applying to weak fields and probably to material containing ferromagnetic impurities. J. W. S.

Magnetic properties of silver difluoride. E. GRUNER and W. KLEMM (Naturwiss., 1937, 25, 59—60).—Redetermination of the mol. susceptibility of AgF_2 prepared in various ways confirms the low val. obtained by Ruff *et al.* (A., 1934, 1080). At 20° the mol. susceptibility independent of the field strength is $440 \pm 30 \times 10^{-6}$. At -183° very high vals. of the susceptibility were found, showing that at this temp. AgF_2 is weakly ferromagnetic. The Curie temp. is approx. -110°. These facts lead to the view that the compound contains Ag-Ag linkings. At higher temp. the spin moments are practically anti-parallel, whereas below the Curie temp. they are partly parallel. A. J. M.

Magnetic anisotropy of molluscan shells.—Sec A., III, 86.

Detection of ultrasonic waves in liquids. L. BERGMANN and H. J. GOEHLICH (Physikal. Z., 1937, 38, 9—13).—A divergent beam of light is passed through a liquid through which ultrasonic waves are being transmitted perpendicular to the direction of the light. Bright and dark bands are produced on a screen placed on the far side of the vessel containing the liquid. With stationary waves a set of bands is seen, but with progressive waves a single sharply-defined band is produced. A. J. M.

High-frequency vibrations and ultrasonics. L. BERGMANN (Chem.-Ztg., 1937, 61, 47—48).—A review of their production, investigation, and application. R. C. M.

Diffusion and absorption of ultrasonics in liquids. R. LUCAS and P. BIQUARD (Trans. Faraday Soc., 1937, 33, 130—135; cf. A., 1936, 1330).—The diffusion of ultrasonic waves by liquids is that predicted by theory, and is explained by the existence of vol. elements (mol. aggregates) having a compressibility \ll that of the liquid in bulk. Heterogeneity of a similar kind can also account for the anomalously large absorption of ultrasonics. F. L. U.

Absorption of ultrasonic waves in liquids. J. CLAEYS, J. ERRERA, and H. SACK (Trans. Faraday Soc., 1937, 33, 136—141).—A detailed account of work already noted (A., 1936, 787). F. L. U.

Latent heat of evaporation of liquid helium. J. N. FRIEND (Nature, 1936, 138, 1102).—With Burton's data for η (A., 1935, 438), the author's equation (*ibid.*, 575) gives 36.2 for the molar latent heat of evaporation. With Onnes' data, the Clausius-Clapeyron equation gives 31.3. In view of the slightly greater temp. range in the latter case and the experimental difficulties the agreement is satisfactory. L. S. T.

Nature of space occupation of organic molecules as decisive factor for the magnitude of the molecular latent heat of fusion. J. PRISCH (Ber., 1937, 70, [B], 12—23).—The nature of the atoms concerned in the structure of a dicyclic compound has little influence on the magnitude of the mol. latent heat of fusion if the mol. structure is almost equally developed in all three directions. The decisive factor is the mode of space occupation and not the extent. Structural moments due to the cyclic nature are not answerable since compounds which do not contain rings but having mols. characterised by equal development in all three directions have also very small mol. latent heats of fusion (CBr_4 , C_2Cl_6 , Bu^vCO_2H). Strongly marked spherical space occupation of a mol. is here the dominating influence as in the incidence of isomorphism and the formation of mixed crystals. Every group of substances, characterised by its mode of space occupation, shows in itself, apart from the region of very low m.p., a linear relationship between mol. latent heat of fusion and position of m.p. and differs from compounds with other types of space occupation. The first type with very pronouncedly spherical space occupation includes *dicyclo*-[1:2:2]-heptane and -[2:2:2]-octane and their derivatives, ketones of the α -*dicyclopentadiene* series, C_2Cl_6 , CBr_4 , CCl_4 , CH_4 , C_2Me_6 , CCl_3CO_2H , Bu^vCO_2H , and Bu^vOH . The second type includes more or less flattened mols. and is illustrated by iso- and hetero-cyclic compounds and their differing stages of hydrogenation. Here the nature of at. groups and the no. of substituents have somewhat greater influence on the mol. latent heat of fusion. The extent of the flattening appears unimportant. In the third type, consisting of thread-like mols., the mol. latent heat of fusion increases markedly with each additional member and so regularly that mathematical expressions can be derived for *n*-paraffins and fatty acids. The at. latent heats of fusion of the rare gases are of the same order as the mol. heat of the spherically-formed CH_4 . Certain compounds, chiefly monocyclic polymethylenes, do not fit in with this classification and an unknown factor is involved. H. W.

Ebulliometric and tonometric study of normal aliphatic alcohols. M. WOJCIECHOWSKI (J. Res. Nat. Bur. Stand., 1936, 17, 721—726).—Using Swientoslawski's technique, the following b.p. and vals. for dt/dp , expressed in °C. per mm. Hg, have been obtained. MeOH, 64.509°, 0.0331; EtOH, 78.325°, 0.0334; Pr^iOH , 97.209°, 0.0344; Bu^iOH ,

117.726°, 0.0372; $n\text{-C}_5\text{H}_{11}\cdot\text{OH}$, 138.06°, 0.0402. Beginning with $\text{Pr}\cdot\text{OH}$, the introduction of CH_2 into the chain of a n -aliphatic alcohol increases dt/dp by the same amount, viz., 0.0029, as does its introduction into an aliphatic hydrocarbon. C. R. H.

Calculation of b.p. K. BILLIG (Ber., 1937, 70, [B], 157—162).—The calculation of the b.p. of a substance from those of initial or final substances or from the b.p. of comparative substances is effected with mathematical accuracy according to $T' = x \cdot T_A \times f_1 A_x \times V_1 A_x / f_{1A} \times v_{1A}$, where T_A and T_{Ax} are the b.p. of the monomeric and polymeric compounds, f_{1A} and f_{1Ax} the association factors, and V_{1A} and V_{1Ax} the sp. vols., and $T' - T''$. Since, however, the association factors are calc. from the b.p. the correctness of these equations can be established by comparison between the calc. and observed vals. but other physical magnitudes which are parallel to the association factors must be involved; for these mathematical expressions are developed. Since these are approximations the b.p. calc. therefrom are also approx. In view of these conditions the agreement of calc. and observed vals. is satisfactory and proof is afforded that the b.p. of a given substance is the arithmetical mean of those of the initial or produced substances when association and d are also taken into account. H. W.

Range of stability of the fluid state. F. SIMON (Trans. Faraday Soc., 1937, 33, 65—73).—Along the m.p. curve the entropies of the solid and liquid phases approach an intermediate val., indicating a growing similarity between the phases with rising melting temp. Experimental data do not preclude the existence of continuity between the cryst. and liquid state. F. L. U.

Theoretical metallurgy. V. Heats of fusion of inorganic substances. VI. Revision of the entropies of inorganic substances—1935. K. K. KELLEY (U.S. Bur. Mines, 1936, Bull. 393, 166 pp., Bull. 394, 55 pp.).—V. A crit. survey is given of fusion and v.p. data for elements, anhyd. inorg. compounds, and their binary mixtures. The m.p., heat and entropy of fusion of 56 elements and many of their inorg. compounds are tabulated.

VI. Sp. heats at low temp. and spectroscopic data for inorg. substances are critically surveyed. Entropies of 72 elements and many inorg. compounds are tabulated. J. G. A. G.

Carbonyl sulphide. Heat capacity, vapour pressure, heats of fusion and vaporisation. Third law of thermodynamics and orientation equilibrium in the solid. J. D. KEMP and W. F. GIAUQUE (J. Amer. Chem. Soc., 1937, 59, 79—84).—COS has m.p. 134.31° abs., b.p. 222.87° abs., heat of fusion 1129.8 g.-cal. per mol., heat of vaporisation at b.p. 4423 g.-cal. per mol., v.p. of liquid (161.8—223.8° abs.) $\log_{10} P = -(1318.260/T) + 10.15309 - 0.0147784T + 0.00018838T^2$, d (of gas at 25° and 1 atm.) 2.4849 + 0.0005 g. per litre. Data for heat capacities of solid and liquid COS from 15° abs. to the b.p. are recorded. The calc. entropy from the above data is 52.56 g.-cal. per degree per mol. for the ideal gas at the b.p., which agrees with that (52.66)

calc. from electron-diffraction and spectroscopic data. The agreement shows that the difference in size between the O and S ends of the mol. suffices to prevent random orientation of the type found in CO, N₂O, and NO at low temp. E. S. H.

Molecular heat, entropy, and chemical constant of phosphine. K. CLUSIUS and A. FRANK (Z. physikal. Chem., 1936, B, 34, 405—419).—Mol. heats of the solid at 11—140° and liquid at 140—186° abs. have been determined. Owing apparently to restricted rotation in the lattice, solid PH₃ exists in three forms (cf. A., 1933, 1000) with the following temp. and mol. heats of transition: III → II, 30.3°, 19.6; II → I, 88.5°, 114.3; I → liquid, 139.6° abs., (m.p.) 267.9 g.-cal. (mol. heat of fusion). There are "humps" in the mol. heat curve at 35° and 51° abs. The thermal entropy derived from the experimental data and the statistical entropy, neglecting the contribution of the nuclear spin, are at the b.p./1 atm. (185.7° abs.) for the ideal gas 46.39 and 46.43, respectively. The agreement between these vals. shows that the occurrence of *o*- and *p*-forms does not affect the caloric entropy val., that Nernst's heat theorem is applicable to PH₃, and that the moment of inertia about the axis of the figure is about 8.26×10^{-40} g. per cm.² (cf. A., 1934, 1289). The chemical const. is i_p (v.p.) $-0.66_6 \pm 0.02$, i_k (statistical) -0.66_2 . Initial mol. heat measurements and a transition point observed at 37.0° abs. were not reproducible, a phenomenon probably connected with the formation of "frozen-in" phases. R. C.

Molecular heat, entropy, and chemical constant of hydrogen sulphide. K. CLUSIUS and A. FRANK (Z. physikal. Chem., 1936, B, 34, 420—431; cf. A., 1936, 278).—The three forms of solid H₂S have the following temp. and mol. heats of transition: III → II, 103.5°, 362.1; II → I, 126.2°, 108.7; I → liquid, 187.6° abs. (m.p.), 568.3 g.-cal. (mol. heat of fusion). The statistically and thermally derived entropies for the gas at 212.8° abs./1 atm. are 46.42 and 46.33 ± 0.10 , respectively. Mol. heats of the solid and liquid have been measured at 11—209° abs. The chemical const. is i_p (v.p.) -0.91 ± 0.03 , i_k (statistical) -0.89 . An index to the purity of a gas is the effect on its triple-point pressure of variation in the relative amounts of solid and liquid phases. R. C.

Dependence on temperature of specific heat (C_v) of monatomic liquids. E. BARTHOLOMÉ and E. EUCKEN (Trans. Faraday Soc., 1937, 33, 45—54; cf. A., 1936, 1057).—The Teller-Poschl potential is employed to calculate C_v curves of liquids. The calc. curves agree qualitatively with experiment for H₂ and He throughout the whole temp. range.

F. L. U.

Heat capacity and vapour pressure of solid carbon dioxide. Heat of sublimation and thermodynamic and spectroscopic values of the entropy of carbon dioxide. W. F. GIAUQUE and C. J. EGAN (J. Chem. Physics, 1937, 5, 45—54).—An apparatus for low-temp. calorimetric and v.p. measurements on condensed gases is described and the heat capacity of solid CO₂ has been measured from 15° to 195° abs. The heat of vaporisation at the

sublimation point is 6030 g.-cal. per mol. Thermodynamic and spectroscopic vals. for the entropy of gaseous CO_2 at 298.1° abs. are respectively 51.11 and 51.07 g.-cal. per degree per mol. W. R. A.

Heat capacity and entropy of rhombic and monoclinic sulphur. E. D. EASTMAN and W. C. MCGAVOCK (J. Amer. Chem. Soc., 1937, 59, 145—151).—Heat capacities of rhombic and monoclinic S are recorded for 15 — 375° abs. The calc. entropies at 298.1° abs. are 7.624 ± 0.05 and 7.78 ± 0.1 e.u., respectively. The entropy difference agrees with that obtained from the heat of transformation.

E. S. H.

Elastic constants and specific heats of the alkali metals. K. FUCHS (Proc. Roy. Soc., 1936, A, 157, 444—450).—Mistakes in the recent calculation of the elastic consts. of the alkali metals (A., 1936, 672) are corr.

L. L. B.

Heat capacity of tin sulphide at high temperatures. A. N. KRESTOVNIKOV and E. I. FEJGINA (J. Phys. Chem. Russ., 1936, 8, 74—76).—The heat capacity of SnS has been determined at $t = 15$ — 700° by a H_2O calorimeter. The mean molar heat capacities are 12.51 (0 — 100°), 12.36 (0 — 300°), 12.96 (0 — 500°), 14.02 (0 — 700°). The true heat as a function of temp. is given by: $c = 0.0850 - 4.730 \times 10^{-5}t + 1.465 \times 10^{-7}t^2$.

E. R.

Specific heat of copper, zinc, and lead sulphate at high temperatures. A. N. KRESTOVNIKOV and E. I. FEJGINA (J. Gen. Chem. Russ., 1936, 6, 1481—1487).—Sp. heat data are recorded, at 300 — 800° .

R. T.

Anomalous specific heats of the anhydrous salts FeCl_2 , CrCl_3 , CoCl_2 , and NiCl_2 . O. N. TRAPEZNIKOVA and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, Spec. no., June, 1936, 6—21).—The heat capacities of FeCl_2 , CrCl_3 , and CoCl_2 show max. at about 23.5° , 16.8° , and 24.9° abs., respectively. NiCl_2 shows two max. at about 49.55° and 57 — 58° abs., respectively, the exact position of both max. being the higher the lower is the temp. to which the salt is cooled before the measurement.

J. W. S.

Anomaly of the specific heat of anhydrous chromic chloride, cobaltous chloride, and nickel chloride. O. TRAPEZNIKOVA, L. V. SCHUBNIKOV, and G. MILJUTIN (Physikal. Z. Sovietunion, 1936, 9, 237—253).—The sp. heat of CrCl_3 , CoCl_2 , and NiCl_2 has been measured at 14 — 130° abs. Abrupt changes occur at 16.8° abs. (CrCl_3), 24.9° abs. (CoCl_2), and 49.6° and 57.0° abs. (NiCl_2). With NiCl_2 the lower is the temp. to which the salt is cooled the higher is the temp. of the two max., the temp. interval between the max. remaining the same.

R. S. B.

Heat capacities and entropies of organic compounds. II. Thermal and vapour-pressure data for tetramethylmethane from 13.22° abs. to the b.p. Entropy from its Raman spectrum. J. G. ASTON and G. H. MESSERLY (J. Amer. Chem. Soc., 1936, 58, 2354—2361; cf. A., 1936, 937).— CMe_4 has m.p. -16.63° , b.p. 9.45° ; there is an energy absorption at -133.14° , which is preceded by an abnormal rise in heat capacity. Heat capacity data between 13° abs. and the b.p. are

recorded. The v.p. of the liquid is given by $\log_{10} P_{\text{mm}} = -1525.0/T - 2.16979 \log_{10} T + 13.59527$. The calc. mol. entropy of the ideal gas at the b.p. is 71.71 ± 0.3 e.u.; the calc. "spectroscopic" entropy is 80.12 e.u. per mol. at 298.16° abs. and 1 atm.

E. S. H.

Thermal data on organic compounds. XVII. Heat capacity, entropy, and free energy data for five higher olefines. G. S. PARKS, S. S. TODD, and C. H. SHOMATE (J. Amer. Chem. Soc., 1936, 58, 2505—2508).—The sp. heats of Δ^2 -*n*-heptene, Δ^2 -pentadiene, C_2Me_4 , and the two isomeric isobutenes have been measured between 80° and 298° abs. The corresponding heats of fusion have been determined, and the entropies at 298.1° abs. calc. The corresponding free energies have been calc. (excepting C_2Me_4). For Δ^2 -olefines the free energy difference between the olefine and the corresponding paraffin is about 21,000 g.-cal. With increasing no. of radicals attached to the C atoms of the double linking this val. falls progressively to a limit of about 17,000 g.-cal.

E. S. H.

Virial theorem and the theory of fusion. V. HELLMAN (Physikal. Z. Sovietunion, 1936, 9, 522—528; cf. Hill, A., 1936, 551).—The virial theorem has as yet no practical importance for the investigation of at. systems since the potential and kinetic energy of these systems cannot be determined separately except by means of the theorem itself.

O. D. S.

Orthobaric densities of substances as a function of reduced temperatures. H. A. FALES and C. S. SHAPIRO (J. Amer. Chem. Soc., 1936, 58, 2418—2428).—The ratio of orthobaric densities is a function of reduced temp. τ ; consequently the vapour vol. can be expressed as a function of τ and liquid vol. along the saturation line, namely, $\log_e v_g/v_l = k(1 - \dots)$ where v_g and v_l are the orthobaric vols., and k , m , and n are consts. characteristic for a given liquid. A similarity in the mechanism of evaporation of substances is shown by the fact that the respective expansion curves can be expressed by the same equation, the consts. of which have closely similar vals. for substances of diverse chemical and physical properties.

E. S. H.

Absolute temperature T , and the principal thermodynamic relationships. F. ODORE (Atti R. Accad. Lincei, 1936, [vi], 23, 865—870).—Theoretical.

O. J. W.

Quantum theory of the second virial coefficient. L. GROPPER (Physical Rev., 1937, [ii], 51, 50; cf. this vol., 71).—A comparison of the rigorous and approx. formulæ previously deduced.

N. M. B.

Molecular state of the vapour of acetic acid at low pressure at 25° , 30° , 35° , and 40° . F. H. MACDOUGALL (J. Amer. Chem. Soc., 1936, 58, 2585—2591).—Vals. of pV for AcOH vapour have been determined at pressures down to 3 mm. The equilibrium const. for the reaction $(\text{AcOH})_2 \rightleftharpoons 2\text{AcOH}$ has been determined. The calc. heat of dissociation is 16,400 g.-cal. The v.p. of AcOH has been determined and the heat of vaporisation calc.

E. S. H.

Reduced temperature and general properties of pure liquids. E. BAUER, M. MAGAT, and M. SURDIN (Trans. Faraday Soc., 1937, **33**, 81—86).—Using a reduced temp. $\theta = (T - T_c)/(T_c - T_f)$, where T_c and T_f denote the abs. crit. and triple point, respectively, it is shown that P_T/P_f is the same function of θ for all liquids when P denotes sp. vol. or compressibility. The same relation holds for the surface tension of normal liquids, whilst abnormal liquids follow another curve. Two separate curves represent the sp. heat (C_p) of monat. and diat. liquids. The generalisation does not extend to dynamic properties. F. L. U.

Thermal agitation in liquids. L. BRILLOUIN (Trans. Faraday Soc., 1937, **33**, 54—55).—Theoretical. F. L. U.

Partition function for liquids. R. F. NEWTON and H. EYRING (Trans. Faraday Soc., 1937, **33**, 73—78).—A partition function involving the coeff. of expansion and the sp. heats leads to reasonable results for the v.p. of most of the liquids examined. F. L. U.

Intermolecular forces of normal liquids. I. J. HUDLESTON (Trans. Faraday Soc., 1937, **33**, 97—103).—Making probable assumptions with regard to statistical consequences in an assemblage of mols., a general relation is found between a term \propto the abs. temp. and one \propto the thermal expansion. This relation, with only one arbitrary const., agrees with experimental data for Et_2O and isopentane very accurately from the m.p. to about 50° below the crit. temp. The theory also gives rise to a law similar to Trouton's rule. F. L. U.

Temperature drop effect in relation to the determination of the molecular heat of gases. H. S. GREGORY and R. W. B. STEPHENS (Nature, 1937, **139**, 28).—An equation for determining the mol. heat of a gas at a known pressure from the loss of energy of an electrically heated wire is given. Alternatively, when the mol. heat of a monat. gas is known, the pressure readings of a McLeod gauge in the region of rarefied pressures can be checked. L. S. T.

Absolute determination of thermal conductivity of gases. W. NOTHDURFT (Ann. Physik, 1937, [v], **28**, 137—156).—The method of Schleiermacher has been improved and gives the following results for the abs. thermal conductivity of gases at 0° : O_2 , $588.9 \pm 0.4 \times 10^{-7}$; dry CO_2 -free air, $577.7 \pm 1.2 \times 10^{-7}$; H_2 , $424.5 \pm 2.9 \times 10^{-6}$ g.-cal. per cm. degree sec. A. J. M.

Thermal conductivity of heavy hydrogen. W. NOTHDURFT (Ann. Physik, 1937, [v], **28**, 157—158).—The apparatus previously described (see preceding abstract) gives $303.1 \pm 1.3 \times 10^{-6}$ g.-cal. per cm. degree sec. for the thermal conductivity of D_2 at 0° . A. J. M.

Thermal conductivity of saturated gaseous hydrocarbons at low pressure. R. DELAPLACE (Compt. rend., 1936, **203**, 1505—1507).—Comparative data are given for H_2 , CH_4 , C_2H_6 , C_3H_8 , *n*- and *iso*- C_4H_{10} in the pressure range 0.001—0.3 mm.

The conductivity of the hydrocarbons approaches a const. val. at pressures $>$ approx. 0.15 mm.

A. J. E. W.

Viscosity of liquified gases. N. S. RUDENKO and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, Spec. no., June, 1936, 83—90).— η of N_2 , CO , A , CH_4 , and C_2H_4 have been determined at various low temp. In each case η increases rapidly with decrease in temp., but remains $<$ that for H_2O . J. W. S.

Viscosity of liquid sodium and potassium. Y. S. CHIONG (Proc. Roy. Soc., 1936, **A**, **157**, 264—277).— η of Na and K have been determined by the oscillating-sphere method from temp. near the m.p. to 360° . The data suggest that a crystal structure of these metals persists for a few degrees above the m.p. Results obtained for both Na and K are in agreement with Andrade's two η formulæ (A., 1934, 356). L. L. B.

Motion of a viscous fluid under a surface load. II. N. A. HASKELL (Physics, 1936, **7**, 56—61; cf. *ibid.*, 1935, **6**, 265).—Mathematical. F. L. U.

Mechanism of the viscosity of liquids. S. CHAIKIN (Physikal. Z. Sovietunion, 1936, **9**, 504—521).—Theoretical. It is supposed that a liquid consists of a no. of small groups of mols., and that η of the liquid is due to tangential forces acting between these groups identical with those opposing slipping between the planes of the crystal. By comparison of η with the forces of slipping in the crystal it is calc. that the linear dimensions of the groups are of the order of 3×10^{-7} to 1.5×10^{-6} cm. O. D. S.

Viscosity of pure liquids. A. G. WARD (Trans. Faraday Soc., 1937, **33**, 88—97).—In the relation $\eta = Ae^{B/RT}$, the magnitude of B (energy associated with configurative changes produced by shearing) depends on the co-ordination, and on interionic, interat., or intermol. forces, being, e.g., large for ionic and small for non-polar liquids. When these factors do not change with temp., the relation between η and $1/T$ is linear. There is close resemblance between the configurative changes involved in melting and in viscous flow, and for liquids of the same structural type in which melting corresponds only with a transition from order to disorder the ratio $B/(\text{heat of fusion})$ is const. F. L. U.

Flow of liquids in an electric field. II. Influence of electric field on the viscosity of liquids. P. SOKOLOV and S. SOSINSKI (Acta Physicochim. U.R.S.S., 1936, **5**, 691—726; cf. A., 1936, 418).—The viscosity (η) of liquids has been measured in a capillary viscosimeter of square section in which two opposite walls were of Pt. On applying a direct or alternating (50 and 1000 cycles) electric field, a considerable increase of η is observed with Et_2O , CHCl_3 , EtI , COMe_2 , PhNO_2 , and NH_2Ph , and no change with C_6H_6 , PhMe , C_6H_{14} , or CCl_4 . Addition of small amounts of polar impurities (HCl , COMe_2) to C_6H_6 , PhMe , of C_6H_{14} gives rise to a positive effect. The magnitude of the effect with pure liquids depends on the conductivity (λ), and with Et_2O and CHCl_3 is $\propto \sqrt{\lambda}$. The effect is considered to depend on the passage of current through the

liquid rather than on orientation of the mols. It cannot be attributed either to electrolytes or to the movement of solvated ions. F. L. U.

Effect of an electric field on the viscosity of liquids. E. D. ALCOCK (Physics, 1936, 7, 126—129).—Measurements were made with a no. of common liquids for fields up to 2000 volts per cm. Changes in η up to 200% occurred and the following points were disclosed: (1) liquids with no dipole moment (*e.g.* C_6H_6) show no effect; (2) in general the greater is the dipole moment the greater is the effect; (3) the greater is the viscous force in the liquid the smaller is the effect; (4) little or no change in η occurs until a crit. field strength is reached. A. E. M.

Mobility of copper ions in rock-salt. S. A. ARZIBISCHEV and N. B. BORISSOV (Physikal. Z. Sovietunion, 1936, 10, 44—55).—The mobility of Cu ions in NaCl under the influence of a p.d. is given at 540—750° by $5.98 \times e^{-12600/T}$ cm.² per sec. per volt, and is independent of [Cu⁺⁺]. With NaCl crystals containing centres due to electron bombardment the mobility is less. The smallest [Cu] which can be detected by the method of electron coloration is 2×10^{-7} g. per g. of NaCl. R. S. B.

Diffusion of copper in rock-salt. S. A. ARZIBISCHEV (Physikal. Z. Sovietunion, 1936, 10, 56—66; cf. preceding abstract).—The diffusion coeff. (*D*) of Cu in rock-salt has been studied by the method of electron coloration, and is given by $D = 1.07 \times e^{-13100/T}$ sq cm per sec. Vals. obtained for *D* are in approx. agreement with those calc. from $D = kTU$, where *U* is the ionic mobility under the force of 1 dyne. R. S. B.

Theory of binary solutions. K. FREDENHAGEN (Z. Elektrochem., 1937, 43, 28—42).—Theoretical (cf. A., 1936, 1463). E. S. H.

Change of volume on mixing and equations for non-electrolyte mixtures. G. SCATCHARD (Trans. Faraday Soc., 1937, 33, 160—166).—The vol. change on mixing may be calc. approx. from the change in free energy or heat content, or from energies of vaporisation of the components. The excess entropy of mixing is expressed as the product of the vol. change and the ratio of the coeffs. of thermal expansion and compressibility. F. L. U.

Apparent volumes and thermal expansions of salts in aqueous solution between 20° and 40°. R. E. GIBSON and J. F. KINCAID (J. Amer. Chem. Soc., 1937, 59, 25—32).—Thermal expansions of aq. $BaCl_2$, KBr , KNO_3 , NaI , and $LiBr$ and sp. vols. (at 25°) of aq. KNO_3 , NaI , and $LiBr$ have been determined throughout the range of possible concns. The results are expressed as functions of temp. and concn. A linear relation between apparent expansibility and concn.¹ is fortuitous; the complete curve is sigmoid. E. S. H.

Thermal expansion of binary systems in the fused state. A. LEONTIEVA (J. Phys. Chem. Russ., 1936, 8, 68—73).—Sp. vol. data for fused mixtures of $NaPO_3$ and $NaBO_2$ at 600—1000° afford evidence for the formation of the compound $NaBO_2 \cdot NaPO_3$.

Corresponding data for mixtures of KPO_3 and $Na_2B_4O_7$ afford no clear evidence of compound formation. E. R.

Surface of the liquid in the phase diagram, and thermal expansion and viscosity of alcohol-water solutions of lithium chloride. II. N. A. SCHALBEROV and N. M. OSTROUMOVA (J. Phys. Chem. Russ., 1936, 8, 117—123).—Measurements of *d*, thermal expansion (α), and viscosity (η) have been made for 7 ternary mixtures of H_2O , $EtOH$, and $LiCl$, of m.p. -35° . The data for α and η suggest the formation of $EtOH \cdot 5H_2O$ (I). The singularities are more pronounced in the presence of Li than in binary $EtOH-H_2O$ mixtures. This may indicate that (I) plays a part in the solvation of Li^+ ions. E. R.

Viscosity of binary mixtures. E. L. LEDERER (Nature, 1937, 139, 27—28).—The author's equation (A., 1932, 116) as well as that of Arrhenius is preferable to that of van der Wyk (this vol., 72). L. S. T.

Viscosity of aqueous solutions of electrolytes as a function of the concentration. IV. Potassium ferrocyanide. G. JONES and R. E. STAUFFER (J. Amer. Chem. Soc., 1936, 58, 2558—2560; cf. A., 1936, 678).—Vals. of *d* and η at 0° and 25° are recorded for a wide concn. range. The results confirm approx. the equation of Falkenhagen for the computation of the influence of interionic attraction on η . E. S. H.

Viscosity of aqueous solutions of various salts. V. F. POSTNIKOV and I. P. KIRILLOV (J. Appl. Chem. Russ., 1936, 9, 1926—1928).—Vals. of η and *d* for 0.5—10*M* $NaNO_2$, $-(NH_4)_2CO_3$, and $-NH_4HSO_4$ at 0—100° are recorded. R. T.

The viscosity-concentration formula. E. M. BRUINS (Chem. Weekblad, 1937, 34, 78—79).—On the assumption that viscosity is associated with min. energy dissipation, the formula $\eta_r = ac + \cosh bc$ is derived; this is shown to be in agreement with other formulæ which have previously been put forward. S. C.

Combination of fatty acids with nitrogen bases. II. Piperidine and lower fatty acids: conductivities and viscosities of liquid anhydrous salts. E. B. R. PRIDEAUX and R. N. COLEMAN (J.C.S., 1937, 4—10; cf. A., 1936, 1449).—Conductivities, κ , and mol. conductivities, Λ , of the liquid piperidine salts decrease with increase of mol. wt. of the fatty acid (propionic to octoic). From the magnitude of κ and its temp. coeff. it appears that the salts are weak electrolytes. The curve relating the composition of piperidine-hexoic acid mixtures and Λ has two max., but there is one max. each in the composition-viscosity (η) curve and the composition- $\Lambda\eta$ curve. The results indicate a higher degree of mol. and electrolytic combination than has been found previously in such systems. J. G. A. G.

Surface tension of solutions of electrolytes as a function of concentration. I. Differential method for measuring relative surface tension. G. JONES and W. A. RAY (J. Amer. Chem. Soc., 1937, 59, 187—198).—A differential method of

measuring the surface tension (σ) of solutions relatively to that of the solvent by a modified capillary apparatus is described. Results for aq. KCl, K_2SO_4 , and $CsNO_3$, respectively, at 25° over a wide concn. range show that at concns. $>0.01N$, σ increases with concn. in a way that is typical of capillary-inactive, strong electrolytes, which are negatively adsorbed at the surface. A min. σ is observed about $0.001N$, below which the solute is positively adsorbed at the surface. Sucrose gives a linear σ -concn. curve without change in the sign of the slope at extreme dilutions. The behaviour at extreme dilutions is ascribed to interaction between ions and polarised H_2O mols. E. S. H.

Structure of molecular complexes in the liquid phase. S. GLASSTONE (Trans. Faraday Soc., 1937, 33, 200—206).—Dielectric polarisations have been determined for mixtures of $CHCl_3$ with Et_2O , $(CH_2Cl-CH_2)_2O$, Pr^t_2O , $COMe_2$, quinoline; Et_2O with $CHBr_3$, $CMeCl_3$, CCl_4 , CBr_4 , C_2HCl_5 , C_2Cl_6 ; Pr^t_2O with $CHBr_3$, CCl_4 , CBr_4 . In all cases complexes are formed in the liquid phase, and the mass-action consts. are calc. There is no necessary relation between the structure of a complex in the liquid phase and that of a solid compound of the same components. F. L. U.

Dipole interaction in mixtures of benzene with its polar derivatives. A. R. MARTIN (Trans. Faraday Soc., 1937, 33, 191—198; cf. A., 1934, 1063).—Vals. of the dielectric const. (D) are given for mixtures of C_6H_6 with CH_2Ph-OH , $PhOH$, $PhCN$, $PhNO_2$, $PhCl$, $PhBr$, NH_2Ph , and $PhOMe$. A linear relation is found between $-\log a/N$ and $(D-1)/(2D+1)$, where a is the activity (cf. A., 1934, 21) and N the mol. fraction of the polar constituent, except for mixtures of low D in which dispersion forces are considered to be comparable in influence with dipole interaction. F. L. U.

Dipole solvation. W. H. BANKS (Trans. Faraday Soc., 1937, 33, 215—224).—Existing data are used to test the equations derived by Martin (A., 1929, 1389), Bell (A., 1931, 901), and Kirkwood (A., 1934, 962), expressing the free energy of solvation of a dipole solute in terms of its dipole moment and the dielectric const. of the medium. After correction for interaction energy, Martin's equation is in better agreement with experiment than either of the others. Lack of agreement with a purely electrostatic model in many cases is due to the magnitude of the interaction energy contribution. F. L. U.

Heat of fusion of mixtures of heavy and ordinary water. O. REDLICH and J. ZENTNER (Monatsh., 1936, 68, 407—414).—The heat of fusion (L) of D_2O is 1508 g.-cal. per mol. For mixtures of H_2O and D_2O , $L = 79.670 - 4.383M_2$ g.-cal. per g., where M_2 is the mol. fraction of D_2O present. J. W. S.

X-Ray investigation of pure iron-nickel alloys. I. Thermal expansion of alloys rich in nickel. E. A. OWEN and E. L. YATES (Proc. Physical Soc., 1937, 49, 17—28).—Measurements for alloys containing 97—73 at.-% Ni show that the expansion of the crystal lattices agrees closely with that of

composite masses of crystals. The addition of Fe to the Ni lattice causes the latter to expand in proportion to the amount of Fe added, and raises, but not proportionately, the discontinuity temp. in the thermal expansion curve. The face-centred structure persists from room temp. through the transformation temp. up to 600°. No ageing effect was observed in a 94 at.-% Ni alloy over 15 months. N. M. B.

Paramagnetism of copper-nickel alloys. G. GUSTAFSSON (Ann. Physik, 1937, [v], 28, 121—31).—The at. susceptibility of the entire range of Ni-Cu alloys has been determined at a series of temp. A. J. M.

Thermal expansion of lead-antimony alloys. P. HIDNERT (J. Res. Nat. Bur. Stand., 1936, 17, 697—708).—The linear expansion of Pb-Sb alloys containing 2.9—98.0% Sb has been measured between -12° and 200° . The coeff. of expansion and the α of the alloys decrease linearly with increase in the at.-% of Sb. C. R. H.

Gold-sodium alloys. W. HAUCKE (Naturwiss., 1937, 25, 61).—X-Ray analysis of Au-Na alloys shows that the range of homogeneity of the Au_2Na phase is approx. 32—42 at.-% Na. Debye-Scherrer diagrams of this phase give cubic indices with a 7.79 Å., and 24 atoms in the unit cell. Melts rich in Na give a phase showing tetragonal symmetry with 6 atoms in the unit cell; this is probably $AuNa_2$. A. J. M.

Gold-manganese alloys. V. A. NEMILOV and A. A. RUZNITSKI (Ann. Sect. Platine, 1936, 13, 129—143).—The compounds $AuMn$, $AuMn_2$, and $AuMn_3$ are suggested by m.p., hardness, conductivity, and metallographic data. $AuMn$ forms solid solutions with Au and Mn, which break down on cooling to yield $AuMn_2$ and $AuMn_3$. R. T.

Anomaly in the expansion of platinum-iron alloys. A. KUSSMANN (Physikal. Z., 1937, 38, 41—42).—The coeff. of expansion of Pt-Fe alloys between 20° and 70° suddenly becomes negative at 50—60 wt.-% Pt. A. J. M.

Palladium-silver alloys. E. J. RODE (Ann. Sect. Platine, 1936, 13, 167—175).—Thermal, hardness, and metallographic data indicate the formation of an unbroken series of solid solutions. R. T.

System platinum-silicon. N. M. VORONOV (Ann. Sect. Platine, 1936, 13, 145—166).—M.p., hardness, conductivity, and metallographic data confirm the existence of $PtSi$ and Pt_2Si , and suggest the formation of Pt_5Si_2 , m.p. 983° (decomp.); evidence of the existence of Pt_3Si , Pt_3Si_2 , or $PtSi_8$ is not obtained. Brittle and fusible Pt-Si alloys are formed when Pt is heated in contact with material containing Si in a reducing atm., and may lead to loss of Pt and to damage of laboratory equipment. R. T.

Spectral emissivities, resistivity, and thermal expansion of tungsten-molybdenum alloys. P. N. BOSSART (Physics, 1936, 7, 50—54).—Spectral emissivities of W-Mo alloys (W 25, 62.5, and 87.5 wt.-%) have been found to exceed the vals. calc. from the mixture rule by 20 and 10% at 1300° and 2200° abs., respectively. In the case of the 62.5%

alloy the resistivity exceeds the calc. val. by 48% in the range 1300—2200° abs., whilst the thermal expansion at 2000° abs. is approx. that calc. from the vol. composition. F. L. U.

Recognition of crystal symmetry [in alloys] by observations of the polarisation colours between crossed nicols. M. VON SCHWARZ and H. DASCHNER (Z. Metallk., 1936, 28, 343—346).—The orientation of the crystallites in Si-Cu and Cu-Al alloys can be determined from observations of the polarisation colours in reflected light if there is no sudden colour change on rotating the stage through 22.5°. Methods of calculating the symmetry are given. A. R. P.

Existence-range of the β Hume-Rothery phases. M. HARA (Nature, 1937, 139, 195).—Concn. ranges in which Hume-Rothery phases are formed in binary alloys of Zn, Cu, Ag, Au, Cd, and Al are tabulated and attention is directed to certain relationships. L. S. T.

Surface tension of amalgams. V. K. SEMENTSCHENKO, B. P. BERING, and N. L. POKROVSKI (Kolloid. Shur., 1935, 1, 205—215).— γ of Hg is reduced by $K > Na > Ba > Cd = Ag$, and slightly raised by Zn. The results agree with the theory of generalised moments (cf. A., 1935, 1315). The significance of γ in the study of alloys is discussed. J. J. B.

Physico-chemical basis of the process of amalgamation. I. N. PLAKSIN and M. A. KOSCHUCHOVA (Ann. Sect. Platine, 1936, 13, 95—111).—The val. of $\cos \theta$ (θ = angle of contact of Hg on Au, Ag, and Au-Ag surfaces) is greatest for Au and least for Ag during the first min. of contact. After 60 min. max. vals. of $\cos \theta$ are obtained with 98% Au alloys, and negative vals. are obtained for 10—55% Au alloys. $\cos \theta$ is increased by presence of 0.05—0.1% of Cu, 0.05% of Zn, or 5% of Au in the Hg, and is diminished by $[Cu] > 0.5\%$ or $[Zn] > 0.1\%$. The retarding action of Cu or Zn is ascribed to formation of a film of oxides at the amalgam surface, in neutral or alkaline, but not acid, solutions. The velocity of amalgamation is increased by polishing the Au or Ag surfaces, or by treating them with nascent H. R. T.

Pure liquids and liquid mixtures. J. KENDALL (Trans. Faraday Soc., 1937, 33, 2—7; cf. A., 1928, 1325).—F.p. and solubility curves for EtOAc in H_2O alone and with varying amounts of EtOH have been determined. Addition of EtOH up to 10.8 mol.-% does not increase the solubility of EtOAc in H_2O , whilst with >20 mol.-% complete miscibility occurs. The f.-p. curves are anomalous. The solid phase is ice throughout, and no compounds have been isolated. Et₂O- H_2O mixtures behave similarly. F. L. U.

Optical determination of solubility. M. VILBORG (J. Phys. Chem. Russ., 1936, 8, 61—67).—Toepler's streaming method may be used for the determination of solubility and for the determination of the concn. of a given solution. The method has been applied to Na K tartrate. E. R.

Solubilities of potassium chloride in deuterium water and in ordinary water from 0° to 180°. R. W. SHEARMAN and A. W. C. MENZIES (J. Amer. Chem. Soc., 1937, 59, 185—186).—Solubility data are recorded and the differences discussed. E. S. H.

Solubility of silver chloride in aqueous solutions of potassium and sodium chlorides. A. PINKUS and M. HAUGEN (Bull. Soc. chim. Belg., 1936, 45, 693—716).—The method previously described (cf. A., 1930, 1246) has been improved and applied to the redetermination of the solubility of freshly pptd. AgCl in 0.0001—1.0M-NaCl and in 0.001—1.0M-KCl. The solubility is a min. in 0.0025M-NaCl or -KCl, the vals. being 2.9×10^{-7} and 2.5×10^{-7} M-AgCl per litre, respectively. At concns. of NaCl or KCl > 0.05 M, the data suggest that almost the whole of the AgCl is in the form of a complex. C. R. H.

Solubility of mercurous sulphate in sulphuric acid solutions. D. N. CRAIG, G. W. VINAL, and F. E. VINAL (J. Res. Nat. Bur. Stand., 1936, 17, 709—720).—The solubilities at 0° and 28° in 0.001—4.0M- H_2SO_4 have been measured, the Hg being determined by electrolytic deposition on Pt. For each temp., the solubility decreases with increase in $[H_2SO_4]$ to a min. val. at approx. 0.03—0.04M, increases to a max. val. at approx. 1.0M, and again decreases. The influence of hydrolysis at low $[H_2SO_4]$ is discussed. Chemical and crystallographic analyses of the solid phases at low and high $[H_2SO_4]$ afford no evidence for the presence of basic or acid salts. C. R. H.

Solubility of mercurous oxalate. G. JANTSCH and E. SCHUSTER (Monatsh., 1936, 68, 399—402).—The solubility of $Hg_2C_2O_4 \cdot H_2O$ in H_2O increases from 2.61 mg. per litre at 18° to 9.50 at 40.2°. The presence of 0.8N aq. $NaNO_3$ is without influence. J. W. S.

Solubility of nicotine silicotungstate in solutions of dilute hydrochloric acid. J. R. SPIES (J. Amer. Chem. Soc., 1936, 58, 2386—2387).—Solubility data for H_2O and 0.001—0.1N-HCl are recorded. Solubility is max. in H_2O and min. in 0.005N-HCl. E. S. H.

Determination of solubility coefficients of naphthalene vapour in tetrahydronaphthalene and in gas-oil. H. MAURAS (Bull. Soc. chim., 1937, [v], 4, 49—58).—Data for 0—40° are recorded. E. S. H.

Solubility of hydrocarbons in mixtures of phenol and water. R. VONDRAČEK and J. DOSTAL (Coll. Czech. Chem. Comm., 1936, 8, 555—560).—The solubilities of *n*-hexane, *n*-heptane, β -methylpentane, methylcyclohexane, and C_6H_6 in PhOH- H_2O mixtures of varying composition have been determined at 20° and 30°. E. S. H.

Velocity of crystallisation from supersaturated solutions. A. N. CAMPBELL and (Mrs.) A. J. R. CAMPBELL (Trans. Faraday Soc., 1937, 33, 299—308).—The times required for the commencement of spontaneous crystallisation of Ba succinate from pure H_2O and from H_2O containing glucose,

EtOH, or agar have been determined for varying degrees of supersaturation. Glucose and agar retard crystallisation. The velocity of crystallisation after inoculation increases with the degree of supersaturation, but there is no evidence of a max. up to 1500% supersaturation. The velocity coeffs. indicate that diffusion does not completely account for the mechanism of crystallisation. The velocity of crystallisation is decreased by increasing the viscosity of the solution.

J. W. S.

Laws of solubility. M. G. EVANS (Trans. Faraday Soc., 1937, **33**, 166—167; cf. A., 1936, 1204).—It is shown that the entropy of dissolution is frequently given by (heat of dissolution)/m.p.

F. L. U.

Extraction of ferric chloride from hydrochloric acid solutions by isopropyl ether. R. W. DODSON, G. J. FORNEY, and E. H. SWIFT (J. Amer. Chem. Soc., 1936, **58**, 2573—2577).— Pr^i_2O gives more efficient extraction over a wider range of acid concn. than does Et_2O .

E. S. H.

Diffusion of gases through metals. IV. Diffusion of oxygen and of hydrogen through nickel at very high pressures. C. J. SMITHELLS and C. E. RANSLEY (Proc. Roy. Soc., 1936, **A**, 157, 292—302).—The rate of diffusion of O_2 through Ni at 900° is independent of the O_2 pressure above 0.25 mm.; this is a consequence of the establishment of equilibrium between the O_2 just inside the metal and the layer of NiO formed on the surface, with which it is in contact. The rate of diffusion of H_2 through Ni, measured at 248° and 400° , $\propto \sqrt{P}$ even up to 112 atm. It is considered probable that some of the energy required for diffusion is derived from the kinetic energy of the gas mols.

L. L. B.

Kinetics of the activated adsorption of hydrogen on polished nickel. E. LEIPUNSKI (Acta Physicochim. U.R.S.S., 1936, **5**, 807—812).—Measurements have been made at -145° and -118° . Only 15% of the H_2 is adsorbed sufficiently slowly for the velocity to be determined. The results agree with a kinetic equation based on Langmuir's theory. The no. of adsorbed mols. is 2.4 times the calc. no. of available places, but the discrepancy is more apparent when absence of saturation is taken into account. The calc. heat of activation is 2050 g.-cal., and the steric factor is 2.2×10^{-4} .

C. R. H.

Platinum electrode. III. Adsorbed atoms and ions on the surface of a platinum electrode. A. FRUMKIN and A. SLIGIN (Acta Physicochim. U.R.S.S., 1936, **5**, 819—840).—Data previously obtained for a platinised electrode in acid and alkaline solutions of NaCl and NaBr (cf. A., 1936, 1207, 1466) have been examined theoretically. In acid solutions the amount of adsorbed gas is negligible over a certain potential range, the p.d. being solely determined by an ionic double layer. In acid solutions for other potential ranges and in alkaline solutions at all potentials, the adsorbed gas has a considerable influence on the p.d. If the amount of adsorbed H_2 is kept const., there is an approx. linear relationship between p.d. and the charge of the double layer. The shape of the characteristic curve of H_2 adsorption on a platinised electrode is

considerably changed by sintering the deposit in H_2 , whereby the total surface is decreased. The ratio of H to Pt atoms is calc. as approx. 1 : 4. It is suggested that the adsorbed H is present both as ions, which may exchange with other ions, and also as atoms.

C. R. H.

Sorption of chlorine by active charcoal. I. Relation between the sorption amounts, the temperature, and the pressure. K. ARII (Bull. Inst. Phys. Chem. Res. Japan, 1936, **15**, 1233—1244).—Sorption measurements at 20° , 30° , and 50° are in good agreement with Langmuir's equation. The relation between the amount a sorbed per g. of charcoal at temp. t , the amount sorbed at 0° , a_0 , and the equilibrium pressure n , is given by $a = a_0 - (0.091 - 12/p)t$.

R. S.

Absorption of mercury vapour by iodised charcoal. I. V. A. PIANKOV (J. Gen. Chem. Russ., 1936, **6**, 1528—1535).—The C is immersed for 24 hr. in 0.1% I in EtOH, C_6H_6 , CS_2 , CHCl_3 , or aq. KI, and dried at 105° (3—4 hr.); the activity of the C rises in the above order with the different solvents. The adsorptive capacity for Hg of I-free C treated with solvents alone rises in the order $\text{CS}_2 < \text{CHCl}_3 < \text{aq. KBr} < \text{aq. KI} < \text{aq. KCl}$.

R. T.

Adsorption by dehydrated chabazite as a function of water content. A. B. LAMB and J. C. WOODHOUSE (J. Amer. Chem. Soc., 1936, **58**, 2637—2646).—Max. adsorption of H_2 , O_2 , and CO_2 at 0° occurs when 97.8, 96.9, and 92.9%, respectively, of the original H_2O content has been removed. For these dehydration vals. max. adsorption of CO_2 occurs at 34.5° , 61.2° , and 100° . The behaviour is attributed to increase of porosity with removal of H_2O so long as the crystal lattice persists, while at the higher temp. required to remove the last portions of H_2O the crystal lattice begins to collapse, with consequent decrease of adsorptive capacity.

E. S. H.

Absorption of phenols and phenol-carboxylic acids by cellulose. K. BRASS and O. GRONVON (Kolloid-Z., 1937, **78**, 51—68; cf. A., 1934, 839).—The absorption of phenolic substances from aq. solution by cellulose (purified cotton and viscose) may occur by either simple dissolution or adsorption. Partition coeffs. (viscose/ H_2O) are as follows: resorcinol 1.04; hydroxyquinol 1.37; phloroglucinol 1.36; pyrogallol 1.35; resorcyloquinol 2.17; dihydroxybenzoic acid (1 : 3 : 4) 6.37; (1 : 3 : 5) 6.32; (1 : 2 : 5) 6.34; gallic acid 3.14; digallic acid 10.46. Adsorption data are given for BzOH , *o*-, *m*-, and *p*- $\text{OH} \cdot \text{C}_6\text{H}_4 \cdot \text{CO}_2\text{H}$, *o*- $\text{OMe} \cdot \text{C}_6\text{H}_4 \cdot \text{CO}_2\text{H}$, and *o*- $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$.

F. L. U.

Adsorption of electrolytes on heteropolar surfaces. D. BALAREV (J. Chim. phys., 1936, **33**, 824—827; cf. A., 1936, 677).—It is inferred, from the rates of dissolution of magnesite in a no. of acids, that anions are adsorbed on the surface in accordance with the Hofmeister series.

R. S.

Adsorption on gels. I. Comparative study of selective adsorption from binary mixtures of liquids on gels of silica, alumina, and ferric oxide. K. S. RAO and B. S. RAO (Proc. Indian Acad. Sci., 1936, **4**, A, 562—570).—The influence of

temp. on the capillary space of Al_2O_3 (I) and Fe_2O_3 gels (II) has been studied. An inflexion in the (I) curve at 500° is attributed to the decomp. of $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$, whilst the max. absorptive capacity for (I) is attained at 950° and for (II) 220° . The selective adsorption of $\text{EtOH}-\text{C}_6\text{H}_6$, $\text{EtOH}-\text{CCl}_4$, $\text{EtOH}-\text{H}_2\text{O}$, $\text{EtOH}-\text{C}_5\text{H}_5\text{N}$, and $\text{C}_6\text{H}_6-\text{CCl}_4$ mixtures by (I) and (II) has been studied and compared with the data for SiO_2 gel. Selectivity is determined by the chemical nature of the gel as well as by the capillary space.

R. S.

Orientation of molecules in the surface layer of an adsorbent, and the adsorption of gases. I. P. V. AFANASIEV, B. A. TALMUD, and D. L. TALMUD (*Acta Physicochim. U.R.S.S.*, 1936, 5, 853—862).—If molten palmitic acid (I) is sprayed and the droplets are allowed to cool, the surface of the particles so formed consists of Me groups ("unconverted"). If molten (I) is emulsified with H_2O at 80° , and the emulsion poured into cold H_2O , the solidified droplets have the CO_2H groups in the surface ("converted"). By dissolving (I) in paraffin wax before emulsifying, "converted" (I) is obtained with varying concns. of CO_2H groups in the surface. "Converted" (I) adsorbs much more NH_3 than does "unconverted" (I), the amount corresponding with 1800 layers of NH_3 mols. in the former case, or 0.64 mol. NH_3 per mol. (I). In paraffin solutions of "converted" (I) the amount of adsorbed NH_3 increases with dilution of (I), and at a concn. of 0.01 mol. (I) per litre, the no. of adsorbed NH_3 mols. is 16.2 times the no. of (I) mols. Since the no. of mols. of NH_3 often exceeds the no. of mols. of (I) and since desorption occurs without heating and adsorption takes place in absence of H_2O , it is almost certain that there is no chemical action between NH_3 and (I). It is probable that the surface CO_2H groups of a "converted" adsorbent are not compensated by the CO_2H of the lower layers. Such uncompensated CO_2H may exist for some distance inside the adsorbent and form adsorption planes identical with the surface layer.

C. R. H.

Multimolecular adsorbed films. II. General theory of the condensation of vapours on finely divided solids. R. S. BRADLEY (*J.C.S.*, 1936, 1799—1804; cf. A., 1936, 1457).—The equation $\log_{10}(p_s/p) - K_1K_3^a + K_4$, where p and p_s are the pressure and saturated pressure, respectively, of the vapour, a is the weight adsorbed, and K_1 , K_3 , and K_4 are consts., has been deduced for the adsorption of dipolar vapours on finely-divided solids. Except at high pressures, when capillary condensation occurs, agreement with recorded data is obtained over a wide range of p/p_s vals. The influence of the formation of a liquid meniscus and of hysteresis is discussed.

J. G. A. G.

Surfaces of ordinary solutions. J. W. MCBAIN, T. F. FORD, and D. A. WILSON (*Kolloid-Z.*, 1937, 78, 1—9).—Recent improvements in the technique of the study of surface tension (σ) and surface adsorption (Γ) are described (cf. A., 1936, 1063, 1355) and in particular a modified Langmuir-Adams trough in which the floating barrier is connected with the walls by a thin membrane which separates not

only the surfaces but also the bulk liquids on either side. The application of newer methods to the measurement of abs. Γ , spreading velocity, and study of time needed for the attainment of a Gibbs equilibrium (e.g., several hr. for $\text{CH}_2\text{Ph}\cdot\text{CH}_2\cdot\text{CO}_2\text{H}$) is discussed. The ascending branch of σ -concn. curves which show a min. is explained on the basis of a submerged electrical double layer, of the order of 100 Å. below the surface.

F. L. U.

Interfacial tension between a benzene solution of palmitic acid and aqueous solutions of potassium hydroxide, potassium cyanide, or barium cyanide. L. GAY and G. NOGARET (*J. Chim. phys.*, 1936, 33, 831—847; cf. A., 1935, 1071; 1936, 1064).—The interfacial tension (γ) has been determined for varying concns. of palmitic acid in C_6H_6 and of KOH , KCN , and $\text{Ba}(\text{CN})_2$ in H_2O . The cyanides produce a lowering of $\gamma >$ the hydroxides at the same concn., a result which cannot be explained by hydrolysis. The significance of the segments and points of inflexion of the curves is discussed.

R. S.

Oiliness of liquids. II. Friction coefficients of films of uni- and multi-molecular layers. H. AKAMATU and J. SAMESHIMA (*Bull. Chem. Soc. Japan*, 1936, 11, 791—796).—The coeff. of friction between glass surfaces is diminished to about one tenth when a unimol. layer of stearic, palmitic, myristic, lauric, oleic, or ricinoleic acid is deposited on one of the surfaces by Blodgett's method (A., 1935, 931). No further decrease occurs when the film thickness is increased, and larger vals. are obtained when the mols. in the film are irregularly arranged.

J. G. A. G.

Primary oxide film on iron. H. R. NELSON (*Nature*, 1937, 139, 30).—Electron diffraction patterns of films of electrolytic Fe evaporated and condensed in a vac. on glass, Fe, Pt, and quartz surfaces show only Fe rings. After exposure to dry air at room temp. and pressure for a brief interval the Fe rings become much fainter and two diffuse bands appear in the same positions as on the electron patterns of abraded Fe. The new bands are attributable to a thin film of Fe_3O_4 overlying the Fe. Traces of oxides on evaporated films have been found on patterns taken after brief exposure to air pressures $>10^{-3}$ mm. of Hg. Heating in air for 3 to 7 min. at 150 — 200° causes the disappearance of the Fe rings and strengthens those due to oxide. The orientation of the oxide lattice in relation to that of the underlying Fe is discussed.

L. S. T.

Influence of capillary tube materials on electrokinetic potential. K. GOSTKOWSKI (*Acta phys. polon.*, 3, 343—345; *Chem. Zentr.*, 1936, i, 1824).—The electrokinetic potential for a paraffin surface is $<$ for shellac but $>$ for glass.

J. S. A.

Dialysis of solutions through collodion membranes. I. Dialysis constants of sodium and potassium chloride in presence of certain substances. W. NOWATKE (*Rocz. Chem.*, 1936, 16, 431—435).—The dialysis consts. of 0.5N-NaCl and -KCl are unaffected by the presence of NaNO_2 , CaCl_2 , NaOAc , $\text{CO}(\text{NH}_2)_2$, glucose, lactose, caffeine, KNO_3 , or K_2CO_3 .

R. T.

Microscopic structure of collodion ultrafilters of graduated porosity. P. GRABAR and J. A. DE LOUREIRO (J. Chim. phys., 1936, 33, 815—823; cf. this vol., 77).—Collodion "Gradocol" ultrafilters have a cluster structure and not a filament structure as previously supposed. Filters of mean pore diameter <100 m μ are birefringent. The influence of drying is discussed and it is shown that the irregular spaces between the clusters may be treated statistically as circular canals. R. S.

Method for determining the distribution of mol. wts. in macro-molecular substances. H. DOSTAL and H. MARK (Trans. Faraday Soc., 1937, 33, 350—353).—The viscosity of solutions of substances with long-chain mols. $\propto i^2$ (where i is the chain length), whereas the osmotic pressure $\propto 1/i$. Hence, if the mean chain length is determined for a mixture of such mols. by each method, an indication is obtained of the distribution of the mol. wts. about this mean val. J. W. S.

Absorption spectra in the near infra-red of solutions of alcohols in ether or dioxan: formation of oxonium compounds. R. FREYMAN (Compt. rend., 1937, 204, 41—43).—The OH absorption band at 0.96μ disappears or decreases in intensity when alcohols are dissolved in Et₂O, dioxan, or COMe₂. The effect is attributed to the formation of oxonium compounds with the solvent mols. A. J. E. W.

Refractometric curves and the state of dissolved strong electrolytes. A. E. BRODSKI (Trans. Faraday Soc., 1937, 33, 256—264; cf. A., 1936, 1197).—Refractivity data for aq. solutions of strong electrolytes and for mixtures of these with non-electrolytes are discussed from the point of view of the hypothesis of complete dissociation. F. L. U.

Light absorption of copper sulphate in heavy water. A. E. BRODSKI and A. A. ZANKO (Acta Physicochim. U.R.S.S., 1936, 5, 919—920).—The extinction coeffs. of 0.437 mol. CuSO₄ in H₂O and in 43.6 and 92.7% D₂O have been measured between 540 and 660 m μ . The coeff. is reduced by D₂O, the reduction being approx. $\propto [D_2O]$. C. R. H.

Diamagnetism of salts in aqueous solution. G. W. BRINDLEY and F. E. HOARE (Trans. Faraday Soc., 1937, 33, 268—272; cf. A., 1935, 569).—Susceptibilities (χ) of ions in solution are closely additive. The difference between the ionic χ in solution and that in the crystal varies progressively with Cn/R^2 (C = degree of hydration, n = charge, R = effective radius), and is small for large univalent ions. F. L. U.

"Force" method of determining the dielectric capacity of conducting liquids at low frequencies: univalent electrolytes in aqueous solution. W. J. SHUTT and H. ROGAN (Proc. Roy. Soc., 1936, A, 157, 359—372).—The dielectric consts., ϵ , of solutions of LiCl, NaCl, and KCl up to 0.04*N*, of HCl up to 0.01*N*, and of NaOH up to 0.02*N* have been determined. The data show that the effect of the presence of univalent ions on the

val. of ϵ for H₂O is $<4\%$. ϵ falls continuously with increasing concn. of electrolyte. L. L. B.

Electrostriction of strong electrolytes. E. ERNST and J. TRUKA (Physikal. Z., 1937, 38, 103—104).—From the variation of the mol. vol. of a solute in solutions of different concn. the vol. contraction (v) per g.-mol. resulting from ionisation may be calc. at different dilutions. By extrapolation the contraction at infinite dilution (v_∞) is obtained. For a no. of solutes examined $v/v_\infty > \Lambda_c/\Lambda_\infty$. A. J. M.

Ultramicroscopic estimation of the size of aerosol particles. B. ROTZEIG and N. FUCHS (Acta Physicochim. U.R.S.S., 1936, 5, 893—902).—The particle radius is calc. from the velocity as measured in a strong reversible electric field, whereby the effect of gravitational velocity can be eliminated, and the Brownian effect minimised. C. R. H.

Stability of foam. T. SASAKI (Bull. Chem. Soc. Japan, 1936, 11, 797).—As the concn. of BuOH in H₂O is increased the stability of the foam produced by shaking rises rapidly to a max. J. G. A. G.

Crystalline arborescences. F. MICHAUD (J. Chim. phys., 1936, 33, 828—830).—Aq. gelatin + NaOH added to CO(NH₂)₂ produces arborescences. R. S.

Dialysis in the study of colloids. IV. Colloidal arsenious sulphide. C. B. JOSHI, P. M. BARVE, and B. N. DESAI (Proc. Indian Acad. Sci., 1936, 4, A, 590—602; cf. this vol., 27).—The cataphoretic speed of As₂S₃ sol decreases with dialysis up to 8 days, increases up to 28 days, and then decreases. The total As, S, and H₂AsO₃, and the KCl and MgCl₂ flocculation vals., have been determined at different stages in the dialysis, and the influence of additions of H₂AsO₃, exposure to artificial light and sunlight, and ageing has been studied. The variation in the cataphoretic speed is attributed to changes in the composition of the sol during dialysis. The results do not support the view that the charge is due to dissociation of an ionogenic complex. R. S.

Spontaneous stable formation of colloids from crystals or from true solution through the presence of a protective colloid. J. W. McBAIN and M. E. L. McBAIN (J. Amer. Chem. Soc., 1936, 58, 2610—2612).—Examples are described. E. S. H.

Mixtures of similarly charged sols. H. R. KRUYT and C. A. NIERSTRASZ (Kolloid-Z., 1937, 78, 26—31).—The influence of a sol on the stability of another having a similar charge has been studied with mixtures in which the stability changes of each component sol could be followed. With Ba(NO₃)₂ as coagulating electrolyte, AgI (negative) sol has a stabilising action on Au sol, the effect being due to I⁻ present in the former as a peptising agent. AgI has little effect on Congo-rubin sol, in agreement with the observed coagulation vals. for Ba(NO₃)₂-KI mixtures. SnO₂ (negative) sol has a stabilising action on Congo-rubin. The protection afforded depends on the method used for preparing the SnO₂, and increases with increasing size of the SnO₂ micelles. F. L. U.

Formation of tactoids in iron oxide sols. K. COPER and H. FREUNDLICH (Trans. Faraday Soc., 1937, 33, 348—350).—Formation of tactoids (spontaneous orientation of particles) has been observed in Fe_2O_3 sols prepared by peptising pptd. $\text{Fe}(\text{OH})_3$ in H_2O with fused $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$. These tactoids are compared with those observed in V_2O_5 and benzo-purpurin sols. J. W. S.

Basic beryllium and complex beryllate hydro-sols; polyolated and polyoxolated structures. A. W. THOMAS and H. S. MILLER (J. Amer. Chem. Soc., 1936, 58, 2526—2533).—The prep. of sols containing Be in the complex cationic and anionic micelles, respectively, is described. The stability of the sols towards electrolytes and heat, and changes occurring during ageing, have been examined. Conductometric titrations of the cationic sols with the salts show that the tendency of the anions to co-ordinate with the Be atom is in the order; citrate > tartrate > NO_3^- . E. S. H.

Critical concentration for micelles in solutions of cetanesulphonic acid. G. S. HARTLEY (J. Amer. Chem. Soc., 1936, 58, 2347—2354).—Conductivity measurements show that aggregation to micelles occurs at a crit. concn., which increases with rising temp. by about 2% per degree, and is raised by glycerol and lowered by amyl alcohol or HCl. Aggregation is practically complete in 0.01N solutions. E. S. H.

Growth of the particles of a hydrosol in the course of flocculation. A. BOUTARIC and (MME.) M. ROY (Bull. Soc. chim., 1937, [v], 4, 173—180).—The changes occurring in colloid solutions after adding an electrolyte and before the resultant pptn. have been followed by measuring the change in the absorption coeff. for light of given λ . The coeff. at first increases rapidly, then slowly, until it reaches a limiting val., which is supposed to correspond with the mean size of the particles at the moment of pptn. The limiting vals. have been determined for sols of As_2S_3 and $\text{Fe}(\text{OH})_3$ flocculated by different electrolytes. E. S. H.

Structure formation in ferric phosphate sols. I. B. REVUT (Acta Physicochim. U.R.S.S., 1936, 5, 679—690).—Coagulation and gel formation in FePO_4 sols closely resemble the same processes in $\text{Fe}(\text{OH})_3$ sols. The more highly hydrated ions are more effective as coagulants. The appearance of H_3PO_4 in the intermicellar liquid as a hydrolysis product gives rise to peculiarities which distinguish the behaviour of these sols from $\text{Fe}(\text{OH})_3$, inasmuch as H_3PO_4 has greater coagulating power than HCl. F. L. U.

Electrophoretic study of silver iodide sol. H. R. KRUYT and G. E. VAN GILS (Kolloid-Z., 1937, 78, 32—40; cf. A., 1934, 253).—The no. of μ -equivs. of a hexol salt (hexol no.) required to reduce the electrokinetic potential (e.k.p.) of AgI particles to zero has been measured directly in the presence of potential-determining and non-potential-determining ions. The hexol no. is greatly increased by addition of KI to the electro-dialysed sol, and slightly reduced by addition of KNO_3 . The max. coagulating effect

is produced with a smaller hexol concn. than that required for complete discharge, whereas with $\text{Th}(\text{NO}_3)_4$ the two concns. coincide. The equilibrium e.k.p. is rapidly attained after addition of non-potential-determining ions (NO_3^-), but with potential-determining ions (I^- , Br^- , Cl^- , CNS $^-$) is reached only after 24 hr. The e.k.p. of both positive and negative AgI sols rises during slow coagulation. F. L. U.

Influence of ultra-violet rays on rhythmic precipitation of silver chromate in an electric field. S. MIYAMOTO (Kolloid-Z., 1937, 78, 23—26).—Incidence of light from a quartz-Hg lamp on a tube in which rhythmic pptn. of Ag_2CrO_4 is in progress causes the width and the separation of the bands to decrease. The effect is probably due to a reaction product of $\text{K}_2\text{Cr}_2\text{O}_7$ and gelatin formed under the influence of the radiation. F. L. U.

Mathematical expression of periodic phenomena. P. F. MICHALEV (Kolloid. Shur., 1935, 1, No. 2, 42—50).—A discussion (cf. A., 1935, 1321). J. J. B.

Colloids and the biological effect of radiation. R. T. M. HAINES (Nature, 1937, 139, 32).—Brownian movement in a colloidal Ca oleate protected by gelatin ceased when the particles were strongly illuminated. Illumination apparently decreases the stability of the colloid sufficiently to permit the small amounts of electrolytes present to effect pptn. L. S. T.

Peptisation of aqueous soap solutions. A. S. C. LAWRENCE (Trans. Faraday Soc., 1937, 33, 325—330).—Aq. soap solutions are peptised by many alcohols, phenols, and amines, which are more sol. in these solutions than in pure H_2O , but the peptised solutions are still colloidal. There is no evidence of the existence of complexes in simple stoichiometric proportions. For each soap-peptiser mixture there is a definite saturation point, the amount of peptiser taken up at this point varying between <1 and 17 mols. per mol. of soap. The effect is attributed to complex formation by dipole interaction, the complexes existing only in solution and their solubilities determining the saturation point. The temp. coeff. of peptisation is low. J. W. S.

Imbibition of hydrosols and of coloured solutions across porous substances. A. BOUTARIC (Bull. Soc. Chim. biol., 1936, 18, 1817—1830; cf. A., 1936, 1196).—The effect of addition of various substances on the rate of ascent of hydrosols and coloured solutions into filter-paper has been examined. For electrolytes the effect depends chiefly on the valency of the active ion and is more marked with colloidal than semi-colloidal dyes. With electro-negative hydrosols and coloured ions, addition of electrolyte usually retards movement but with electropositive sols and ions either retardation or acceleration may occur. Electrolytes with univalent anions accelerate critically; as the concentration increases the effect of the electrolyte increases at first and then decreases. Multivalent anions cause retardation. In all cases movement stops when the flocculation point is reached. The effect of dilution of the colloidal solution with liquids miscible with H_2O has also been investigated. P. W. C.

Syneresis. W. HELLER (Compt. rend., 1937, 204, 43—45).—Three types of syneresis, associated with different types of gel or sol, are distinguished.

A. J. E. W.

Ascorbic and isoascorbic acids as reducing agents for preparing colloidal solutions of gold, palladium, platinum, silver, selenium, tellurium, molybdenum-blue, and tungsten-blue. H. BRINTZINGER (Kolloid-Z., 1937, 78, 22—23).—Details of preps. are given.

F. L. U.

Influence of hydrophilic colloids on base exchange in silicates. E. SAUER and W. RUPPERT (Kolloid-Z., 1937, 78, 71—82).—The rate of displacement of Na by Ca in different artificial zeolites has been measured after addition of hydrophilic colloids to the aq. CaSO_4 . These exercise in general a retarding influence on the exchange, partly direct, but mainly as a result of alteration of the mechanical properties of the filter material by long-continued action. The substances exercising a direct influence are, in order of effectiveness: tragacanth > starch > gelatin > carrageen, gum arabic and tannic acid being without influence. The order of effectiveness in lowering the efficiency mechanically is: gelatin > gum arabic > carrageen > soil colloids > dextrin > umic acids. Tannic acid has no effect.

F. L. U.

Hydration of dyes and change of their dispersity in presence of salts. N. S. SCHEINKER (Acta Physicochim. U.R.S.S., 1936, 5, 739—748; cf. A., 1935, 1201).—Gradual addition of KCl to aq. solutions of diamond-fuchsin is found by diffusion measurements to decrease the size of the particles at first, but this is followed by an increase. The same effect is produced by C_6H_6 in EtOH solution. The decrease is considered to be caused by desolvation under the influence of KCl or C_6H_6 . The average thickness of the solvation films in H_2O and EtOH is 1.7 and 2.6 Å., respectively. In aq. solutions of brilliant-cresyl-blue KCl produces an increase of particle size, but there is no pptn. within a wide range of [KCl].

F. L. U.

Emeraldin sols. III. Influence of acidity of the liquid during oxidation of aniline on the dispersity, colour, and amount of oxidation products. V. PTSCHELIN (Kolloid-Z., 1937, 78, 88—95; cf. A., 1936, 1068).—In the oxidation of NH_2Ph by CrO_3 the nigraniline salt (blue) first formed is reduced to an emeraldin salt (green). In presence of gelatin at low acidity a nigraniline sol is formed, which changes slowly to an emeraldin sol on further addition of acid. On dialysing an emeraldin salt sol, a sol of the free base is produced, which is gradually oxidised to a sol of nigraniline base. Data are recorded for the variation in the amount and ash content of the oxidation products of NH_2Ph with acidity.

F. L. U.

Hydrophilic properties of cellulose. III. Hydrophilic properties of electrically neutral cellulose. K. KANAMARU and T. NAKAMURA (Kolloid-Z., 1937, 78, 83—87; cf. A., 1934, 362).—The hygroscopicity (H) of cellulose (calico and manila paper), treated by immersion in aq. AlCl_3 of varying concns. and subsequent drying, has been measured

L (A., I.)

by determining the H_2O -sorption isotherms. H decreases with increasing $[\text{AlCl}_3]$ and reaches a min. when $\text{Al}(\text{OH})_3$ has been adsorbed in such an amount as to make the cellulose electrically neutral. Further adsorption of $\text{Al}(\text{OH})_3$ confers a positive charge and increases H . The dielectric strength is a max. at the isoelectric point, and varies in the opposite sense to H .

F. L. U.

Potential and stability of sols of cellulose ethers. S. A. GLIKMAN and E. S. MEDVEDKOV (Kolloid. Shur., 1935, 1, No. 2, 3—15).—The cataphoresis of various particles covered with benzyl- or ethyl-cellulose or with cellulose nitrate has been studied microscopically. The electrokinetic potential ζ is very small in org. liquids but high in H_2O . In H_2O - COMe_2 mixtures ζ increases abruptly at the same concn. as that at which the viscosity shows an abrupt decrease. The stability of lyophilic sols is not affected by ζ .

J. J. B.

Colloidal condition of cholesterol, cholesteryl ester, and lecithin. XIV. Formation of cholesterol sols. I. REMESOV (Biochem. Z., 1936, 288, 429—440; cf. A., 1935, 1522).—Data for the reproducibility, dispersivity, and stability of cholesterol (I) sols in H_2O are given and the dependence of these properties on the purity of (I) is discussed. The prep. of (I) sols is possible only in presence of a protective agent.

F. O. H.

Physico-chemical properties of alginic acid. J. K. NOVODRANOV (Ann. Leningrad State Univ., Chem. Ser., 1935, 1, 58—71).—Alginic acid forms well-defined salts with Pb, Zn, Al, Fe, Cu, Ag, K, Na, and NH_4 . The Na, K, and NH_4 alginates yield solutions of high η ; the surface tension at the interfaces H_2O -air and $-\text{C}_6\text{H}_6$ is depressed by the salts where the concn. is 0.125 to 2.5% and augmented at a concn. of 5%.

R. T.

Relaxation time and dipole moment of gliadin. S. ARRHENIUS (J. Chem. Physics, 1937, 5, 63—66).—An expression is derived which connects the relaxation time of a polar mol. with the viscosity of the solvent, and with the diffusion and sedimentation data of the solute. This is compared with data for the variation of the dielectric const. of gliadin with the frequency.

W. R. A.

Free and bound water in agar gels. V. I. ROGATSCHEV (Kolloid. Shur., 1935, 1, No. 1, 79—90).—Robinson's method (A., 1931, 1177) of determining bound H_2O was applied to four samples of agar and four marine algæ. The capacity for binding H_2O is independent of the total amount of H_2O absorbed during the swelling, but both are lowered by salts and the lyotropic series holds for the total amount absorbed. H_2O -binding capacity depends only on the cation and decreases when the valency of the cation increases.

J. J. B.

Extension of gelatin [jellies]. J. H. C. MERCKEL (Kolloid-Z., 1937, 78, 41—50).—Load-extension curves for a cylindrical rod of gelatin jelly have been determined under different conditions. Empirical formulæ are given to show the relation between Young's modulus (E) and gelatin concn., and between E for a 20% jelly and the lyotropic no. of an added

K salt. E is nearly const. between p_H 12 and the isoelectric point, below which it decreases slowly as far as p_H 1, and thereafter rapidly. F. L. U.

Application of chain weight loading to determination of jelly strength. I. J. SAXL (Physics, 1936, 7, 62—66).—Penetration-load curves for gelatin jellies are obtained by means of an instrument in which the chain wt. principle is used for applying the load. The device is suitable for the determination of hysteresis characteristics. F. L. U.

Influence of neutral salts on optical rotation of gelatin. V. Rotatory dispersion of gelatin in sodium bromide solutions. D. C. CARPENTER and F. E. LOVELACE (J. Amer. Chem. Soc., 1936, 58, 2438—2441).—The $[\alpha]$ of solutions of gelatin (I) containing NaBr have been measured at 0.5° and 40° for five λ . The rotatory dispersion obeys a single-term Drude equation and is governed by an absorption band at 2200 Å. The marked change in the rotation caused by NaBr and NaI (cf. A., 1936, 288) at 0.5° is attributed to association of the mol. of (I). Application of Lucas' formulation (A., 1930, 1095) to the data indicates that only two optically active species exist in solutions and gels of (I). H. B.

Physical chemistry of amino-acids, peptides, and related substances. VIII. Relation between activity coefficients of peptides and their dipole moments. E. J. COHN, T. L. MCMECKIN, J. P. GREENSTEIN, and J. H. WEARE (J. Amer. Chem. Soc., 1936, 58, 2365—2370).—The solubilities of glycine (I), carbamidoacetic acid [heptyl ester (II), m.p. 98—99°, prepared from the heptyl ester hydrochloride of (I) and aq. KCNO], α -carbamidohexioic acid [heptyl ester (III), m.p. 70—71°], carbamidoacetylglycine (heptyl ester, m.p. 123—125°), di- and tri-glycine, and lysylglutamic acid in 80% EtOH containing NaCl (up to 0.25M) at 25° are determined (methods: A., 1935, 26; this vol., 24). For low concns. of NaCl the logs. of the activity coeffs. of (I) and the peptides are approx. \propto to their dipole moments. The moments (measured in C_6H_6) of (II) and (III) are 3.6 and 3.5×10^{-18} e.s.u., respectively. H. B.

Physical chemistry of proteins. XIII. Solvent action of sodium chloride on egg albumin in 25% ethanol at -5°. R. M. FERRY, E. J. COHN, and E. S. NEWMAN (J. Amer. Chem. Soc., 1936, 58, 2370—2375).—The solubility of isoelectric egg albumin (I) in 25% EtOH at -5° (little denaturation occurs under these conditions) is 0.13 g. per litre; addition of NaCl (up to 0.489M) causes an increase (up to 41.4 g. per litre). The solvent action of the NaCl is considered a measure of the electrostatic forces between the ions and (I), and is compared with the data for NH_2 -acids and peptides (preceding abstract). H. B.

Adsorption of salts by proteins. T. MORAN (Rep. Food Invest. Bd., 1935, 20—23).—The amount of NaCl remaining when a gelatin-NaCl gel is subjected to pressure \propto initial [NaCl]. The adsorption of NaCl by gelatin would appear to be very slight. In presence of NaCl and LiCl the reduction in the hydration of gelatin \propto the hydration of the cation. E. C. S.

Spreading of fibrinogen. E. GORTER, L. MAASKANT, and G. J. VAN LOOKEREN CAMPAGNE (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1187—1191).—Freshly prepared pure fibrinogen scarcely spreads at all even on acid solutions of p_H 1, but fibrinogen solutions may be caused to spread quite readily by the addition of a trace of trypsin or prothrombase. J. W. S.

Transformation temperature of elastoidin. E. FAURÉ-FREMIET and R. WOELFFLIN (J. Chim. phys., 1936, 33, 801—814; cf. A., 1936, 1462).—The transformation of elastoidin (I \rightarrow II) occurs within 0.5° but the temp. is slightly different for different specimens. When the elastoidin is subjected to tension, the transformation temp. t increases to a max. at 81° for tensions > 200 g. per mm., whilst t approaches 195° as the sample is progressively dried. The influence of acids, bases, salts, etc. on t is related to the increase of aq. imbibition but sp. effects occur. R. S.

Behaviour of the electrical conductivity of ovalbumin with change in temperature. A. ORRU (Atti R. Accad. Lincei, 1936, [vi], 23, 959—965; cf. A., 1936, 877).—The conductivity of aq. ovalbumin varies continuously up to 60° and on cooling no hysteresis effects are observable. When heated to 80°, both dil. and conc. solutions show hysteresis with crit. temp. at 60—62° and 68—72°. The significance of these facts is discussed. F. O. H.

Colloid chemistry of narcosis.—See A., III, 94.

Formation of ethers by the interaction of primary alcohols and olefines at high pressure. D. M. NEWITT and G. SEMERANO (Proc. Roy. Soc., 1936, A, 157, 348—358).—Measurements have been made of the equilibrium const. K for the system $2C_nH_{2n+1}OH \rightleftharpoons (C_nH_{2n+1})_2O + H_2O$, and the following vals. obtained: EtOH, 7.75 (266°); PrⁿOH, 9.40 (250°); BuⁿOH, 11.40 (250°). In the presence of a suitable catalyst and at pressures > 10 atm., C_2H_4 and C_3H_6 combine with EtOH, PrOH, and BuOH to give the corresponding mixed ethers, the reaction $C_nH_{2n+1}OH + C_nH_{2n} \rightleftharpoons (C_nH_{2n+1})_2O$ being reversible and slightly exothermic with respect to ether formation. The reaction is always accompanied by direct dehydration of the alcohol (especially in the case of EtOH) and by partial hydration of the olefine. Vals. of K for the system alcohol-olefine-ether have been determined in each instance. L. L. B.

First dissociation constant of carbonic acid. Y. KAUKO (Ann. Acad. Sci. fenn., 1935, 41, no. 9, 6 pp.; Chem. Zentr., 1936, i, 1818).—Published vals. are reviewed critically. The mean val. $K = 3.12 \times 10^{-7}$ at 18° is adopted. J. S. A.

Chemical nature of aqueous solutions of carbonic acid. Y. KAUKO (Maataloust. Aikak., 1935, 7, 18—28).—From data for the rate of evolution of CO_2 from H_2O at 6—14° the rate appears to be determined entirely by diffusion; between 14° and 28° a unimol. chemical reaction appears to be superimposed. It is inferred that dissolved CO_2 is, in part, chemically bound. J. S. A.

Dissociation constants of organic acids. XVI. Thermodynamic primary dissociation constants of alkylmalonic acids. G. H. JEFFERY and A. I. VOGEL (J.C.S., 1936, 1756—1761).—From data for the conductivities of 0.0001—0.01*N*-Na salts at 25°, the vals. of $K_1 \times 10^4$ for the substituted acids are: methyl- 8.47, ethyl- 10.94, *n*-propyl- 10.26, dimethyl- 7.06, methylethyl- 15.43, diethyl- 70.80, ethylpropyl- 78.37, dipropyl- 91.98. The limiting mobilities of the ions have been evaluated. J. G. A. G.

Theory of III. N. A. TANANAEV (J. Appl. Chem. Russ., 1936, 9, 2055—2057).—Mathematical. R. T.

Strength of acids in formamide. F. H. VERHOEK (J. Amer. Chem. Soc., 1936, 58, 2577—2584).—Dissociation consts. of several carboxylic acids and phenols have been derived from the conductivity of their solutions in $\text{HCO}\cdot\text{NH}_2$. The results agree with those obtained independently by measurement of the p.d. between buffer solutions of the acids and a standard salicylate buffer. Dissociation consts. of a group of singly-charged cation acids have been obtained by the potentiometric method. The ion product of $\text{HCO}\cdot\text{NH}_2$ has the val. 10^{-17} . Comparison of the consts. with corresponding vals. for aq. solutions shows that if a carboxylic acid, a phenol, and a singly-charged cation acid have the same strength in H_2O , the phenol will be ~ 25 times as strong as the carboxylic acid in $\text{HCO}\cdot\text{NH}_2$ and the cation acid ~ 500 times as strong. E. S. H.

Amino-acids and peptides. III. Apparent acid dissociation constants in aqueous formaldehyde solution. M. S. DUNN and J. G. WEINER (J. Biol. Chem., 1937, 117, 381—389).—Relationships (Harris, A., 1929, 648; Levy, A., 1933, 381) between the dissociation consts. of NH_2 -acids and $[\text{CH}_2\text{O}]$ are confirmed and extended to other compounds, and empirical equations valid over a wide range of $[\text{CH}_2\text{O}]$ (0.1—1.8*M*) are given. Structurally and optically isomeric NH_2 -acids have identical acid dissociation consts. F. A. A.

Constitution of solutions of potassium bismuthi-iodides. F. GALLAIS (Compt. rend., 1937, 204, 181—184).—Measurements of magnetic rotatory power (A., 1935, 592) indicate the existence of either $[\text{BiI}_6]^{-3}$ or $[\text{BiI}_7]^{-4}$ in acid solutions of KI and Bi_2O_3 . A. J. E. W.

Hydration of unsaturated compounds. IV. Rate of hydration of isobutene in the presence of silver ion. Nature of the isobutene-silver complex. W. F. EBERZ, H. J. WELGE, D. M. YOST, and H. J. LUCAS (J. Amer. Chem. Soc., 1936, 59, 45—49; cf. A., 1934, 1312).—Determination of distribution coeffs. shows that the complex ion is $\text{C}_4\text{H}_8\cdot\text{Ag}^+$, and the equilibrium const. $[\text{C}_4\text{H}_8\cdot\text{Ag}^+]/[\text{C}_4\text{H}_8][\text{Ag}^+] = 61.7$. The rate coeffs. obtained can be interpreted by assuming that the free C_4H_8 present in aq. AgNO_3 hydrates, but that the complex does not. E. S. H.

Influence of electrolytes on the hydration of some complex cobalt compounds. J. BRÜLL (Compt. rend., 1937, 204, 349—352; cf. A., 1936, 940).—The velocities of hydration of several complexes

of Co containing Cl, Br, I, and NO_3 have been measured and the influence of the bromides of Li, Na, K, Rb, Ba, Ca, and Si is discussed. N. M. B.

Complex formation. G. GLOCKLER (Trans. Faraday Soc., 1937, 33, 224—229).—A general survey is given, and a classification is proposed in which definite chemical compounds are at one end and van der Waals aggregates at the other. The usual conceptions of valency are inadequate to deal with all chemical phenomena, and the distinction between primary and secondary valency forces and van der Waals forces is a matter of convenience rather than of fundamental significance. F. L. U.

Electrical forces between ions and neutral molecules in aqueous solution. Salting-out effect. P. S. ALBRIGHT and J. W. WILLIAMS (Trans. Faraday Soc., 1937, 33, 247—256).—Dielectric consts. of aq. EtOAc solutions at different concns. have been determined at 25° and 50°, and the results have been used, in conjunction with existing solubility data, to examine the validity of Debye's theory of the salting-out effect. The electrolytes considered are the NH_4 and alkali metal halides (not fluorides), MgSO_4 , Na_2SO_3 , and ZnSO_3 . With very dil. salt solutions the calc. solubilities agree well with those observed. In solutions of higher salt concn. departures from theory are to be expected and are observed. They are due in some cases to aggregation of the non-electrolyte leading to "salting-in." Excessive salting-out is unusual, but may be produced by highly hydrated ions. F. L. U.

Intermolecular forces in solutions. J. H. HILDEBRAND (Trans. Faraday Soc., 1937, 33, 144—151).—A general survey, in which the relation between the deviations from Raoult's law and energies of vapourisation is discussed. F. L. U.

Theoretical basis of Raoult's law. E. A. GUGGENHEIM (Trans. Faraday Soc., 1937, 33, 151—156).—Conditions for the validity of Raoult's law are discussed, with special reference to the effect of mol. vol. F. L. U.

Thermodynamics of cadmium chloride in aqueous solution from e.m.f. measurements. H. S. HARNED and M. E. FITZGERALD (J. Amer. Chem. Soc., 1936, 58, 2624—2629).—E.m.f. vals. for the cells $\text{Cd}-\text{CdHg}_x$ (11%) $|\text{CdCl}_2$ (0.0005—1*M*) $|\text{AgCl}-\text{Ag}$ have been determined over the range 0—40°. At 25° $E_0 = 0.57300$ volt. The standard potential of $\text{Cd(s)}|\text{Cd}^{2+}$ at 0—40°, the relative partial mol. heat content and sp. heat of CdCl_2 in aq. solution have been calc. E. S. H.

Activity coefficient of copper sulphate in aqueous solution. F. E. W. WETMORE and A. R. GORDON (J. Chem. Physics, 1937, 5, 60—63).—The e.m.f. of the cell $\text{Cu}|\text{two-phase amalgam}|\text{CuSO}_4|\text{Hg}_2\text{SO}_4|\text{Hg}$ has been measured at CuSO_4 concns. from 0.02*M* to saturation at temp. from 15° to 45°. The activity coeff. of CuSO_4 has been calc. from these measurements and from f.p. and heats of dilution. W. R. A.

Osmotic and activity coefficient data of aqueous salt solutions from vapour-pressure measurements. R. A. ROBINSON (J. Amer. Chem.

Soc., 1937, 59, 84—90).—Data are recorded for TiNO_3 , TiClO_4 , TiOAc , RbNO_3 , RbOAc , CsNO_3 , CsOAc , BaCl_2 , LaCl_3 , $\text{K}_4\text{Fe}(\text{CN})_6$, and $\text{Al}_2(\text{SO}_4)_3$. Data for RbCl , RbBr , RbI , CsBr , and CsI have been redetermined. The abnormally low vals. for Na, K, Cs, and Tl nitrates are ascribed to incomplete dissociation. E. S. H.

Activities of aliphatic alcohols and halides in non-polar solvents. J. A. V. BUTLER and P. HARROWER (Trans. Faraday Soc., 1937, 33, 171—178).—Activity coeffs. (f) of C_6H_6 , CCl_4 , and *cyclohexane* in their mixtures agree qualitatively, but are $>$ those given by Hildebrand's theory. Vals. of f for PrCl , PrBr , PrI , BuCl , and BuBr in the above non-polar solvents are in the order $\text{C}_6\text{H}_6 < \text{CCl}_4 < \text{C}_6\text{H}_{12}$. MeOH , EtOH , PrOH , and BuOH have much larger f vals. in C_6H_6 and CCl_4 , due, it is suggested, to association through formation of "OH" bonds. Entropies of dissolution of the alcohols, and their distribution coeffs. between H_2O and C_6H_6 and CCl_4 , are calc. F. L. U.

Activity of glycine. E. R. B. SMITH and P. K. SMITH (J. Biol. Chem., 1937, 117, 209—216).—The osmotic and activity coeffs. of glycine in H_2O at 25° have been determined by an isopiestic method using sucrose as reference substance (cf. Robinson and Sinclair, A., 1934, 1173). W. McC.

Vapour pressures of saturated solutions. A. E. HIRSCHLER (J. Amer. Chem. Soc., 1936, 58, 2472—2474).—Theoretical. The parallelism of the $\log P-1/T'$ curves for H_2O and saturated aq. solutions is discussed. E. S. H.

Thermodynamic and kinetic considerations of the vapour-pressure lowering of solutions. K. F. HERZFELD (Physikal. Z., 1937, 38, 58—64).—The v.p. of a liquid under pressure, and the mechanism of osmotic pressure as well as the lowering of v.p. are considered, and discussed in relation to the views of Fredenhagen (A., 1934, 252, 728; 1935, 579, 699, 1201). A. J. M.

Volatilisation with water vapour of volatile substances in solution. P. JAULMES (Bull. Soc. chim., 1937, [v], 4, 157—172).—Equations applicable to steam-distillation are deduced theoretically and verified by experiment. E. S. H.

Volatility of boric esters in alcoholic solution. P. JAULMES and E. GALHAC (Bull. Soc. chim., 1937, [v], 4, 135—139).—The volatility of Et_3BO_3 in EtOH and the influence of the presence of H_2O and H_2SO_4 have been examined and compared with data for the volatility of Me_3BO_3 . The results are discussed in relation to the determination of small quantities of H_3BO_3 . E. S. H.

Volatility of boric acid with water vapour. System boric oxide—water. M. VON STACKELBERG, F. QUATRAM, and J. DRESSSEL [with C. F. SPIESS and M. KUPFER] (Z. Elektrochem., 1937, 43, 14—28).—Equilibrium data show that the solid phases are ice, H_3BO_3 (m.p. 170°), HBO_2 (m.p. 203°), and glassy B_2O_3 containing H_2O . The conditions of stability for each of the phases have been determined. The vapour phase in contact with aq. solutions under ordinary

conditions contains H_3BO_3 mols., but at very low H_2O pressures and higher temp. HBO_2 mols. are present. The heats of dissolution of H_3BO_3 , HBO_2 , and B_2O_3 in H_2O have been determined. E. S. H.

Volatility of boric acid. I. Aqueous solutions. P. JAULMES and (MLLE.) A. GONTARD. II. Dry boric acid and superheated steam. P. JAULMES and E. GALHAC (Bull. Soc. chim., 1937, [v], 4, 139—148, 149—157).—I. The $[\text{H}_3\text{BO}_3]$ in the vapour given off by boiling aq. H_3BO_3 at 1 atm. is 0.0036 ± 0.0003 times $[\text{H}_3\text{BO}_3]$ in the liquid. The mol. state of H_3BO_3 in solution is discussed.

II. The composition of the vapour obtained by passing steam over H_3BO_3 at 104 — 204° has been determined. Below 144° the vapour contains H_3BO_3 , but above 144° the volatilised product is HBO_2 . E. S. H.

Deliquescence and efflorescence. Determination of critical hygrometric states. M. DIESNIS (Ann. Chim., 1937, [xi], 7, 5—69; cf. A., 1936, 30).—The v.p. of 75 salts and of their saturated aq. solutions at different temp. have been determined by a static method and compared with previous results. Data for 20° and 25° are tabulated and the crit. hygrometric states are recorded. In certain cases, the latter are related to the solubility, but this is not a general rule. R. S.

Palladium-hydrogen equilibrium and new palladium hydrides. L. J. GILLESPIE and L. S. GALSTAUN (J. Amer. Chem. Soc., 1936, 58, 2565—2573).—The pressure-composition diagram has been investigated between 200° and 313° . The compounds Pd_2H , Pd_3H , Pd_4H , and Pd_5H , but not PdH , are indicated. These compounds are regarded as solid solutions which have a fixed composition over a limited range of temp. Pd reacts with Hg, especially when it contains H_2 , forming Pd_4Hg_3 . E. S. H.

Thermal dissociation of lead peroxide. II. J. KRUSTINSONS (Z. Elektrochem., 1937, 43, 65—66; cf. A., 1934, 733).—The dissociation pressure of electrolytically prepared PbO_2 has been determined between 287° and 314° . The vals. are $>$ those published for pptd. PbO_2 . The calc. heat of dissociation is 20,480 g.-cal. E. S. H.

Thermal dissociation of higher sulphides of nickel. J. I. GERASIMOV, N. I. PIRTZHALOV, and V. V. STEPIN (J. Gen. Chem. Russ., 1936, 6, 1736—1743).— NiS_2 may be prepared from NiS and S at 500° . The v.p. at 700 — 750° of the sulphides represented by NiS_{1-2} rises abruptly when the S content is $>$ that of $\text{NiS}_{1.4}$ (Ni_3S_4 ?). Formation of the solid solutions NiS_2 — Ni_3S_4 and Ni_3S_4 — Ni_6S_5 is suggested by the analytical and v.p. data. R. T.

Liquid and gaseous phases in the system nitrogen-carbon monoxide. N. F. JUSCHKEVITSCH and N. S. TOROTSCHESCHNIKOV (J. Chem. Ind. Russ., 1936, 13, 1273—1283).—Mixtures of CO and N_2 at 90 — 112° abs. conform to the requirements of Raoult's law. The differential latent heats of vaporisation of CO and N_2 for various mixtures have been calc. for different temp. and pressures. Empirical equations connecting fugacity with temp. and pressure are derived. R. T.

Equilibrium curves of low-melting mixtures. M. RUHEMANN (Physikal. Z. Sovietunion, Spec. no., June, 1936, 67—82).—The sp. heats of $\text{CH}_4\text{--C}_2\text{H}_6$, CO--N_2 , $\text{O}_2\text{--N}_2$, A--N_2 , and A--O_2 mixtures have been determined at low temp., and the phase diagrams are indicated. The equilibrium relations between the two series of solid solutions formed by CO and N_2 are studied in detail. J. W. S.

Fusion diagrams of highly refractory oxides. VII. **Systems with CaO and BeO.** H. VON WARTENBERG, H. J. REUSCH, and E. SARAN (Z. anorg. Chem., 1937, 230, 257—276; cf. A., 1933, 27).—The softening temp. and m.p. of the following mixtures are given: CaO with Cu_2O (E), BeO, MgO (E), Al_2O_3 , TiO_2 , ZrO_2 , ThO_2 (E), Mn_3O_4 , NiO (E), CoO (E), Cr_2O_3 ; BeO with Cu_2O , MgO, Al_2O_3 , CeO_2 , TiO_2 , ZrO_2 , ThO_2 , Cr_2O_3 , Mn_3O_4 , Fe_3O_4 , CoO, NiO. The systems with BeO, with the exception of BeO– TiO_2 in which compounds are formed, give exclusively simple eutectic curves, in contrast to the chemically similar MgO mixtures. The CaO systems give simple eutectics only with the oxides marked (E). Mixtures of CaO and Cr_2O_3 give CaCrO_4 when heated in air at temp. $>2100^\circ$, at which the O_2 -dissociation pressure is <0.01 atm. In absence of air $\text{CaO, Cr}_2\text{O}_3$ (m.p. 2170°) is formed. F. L. U.

Liquidus curve and surface of the systems lithium and calcium nitrates and calcium, lithium, and potassium nitrates. A. LEHRMAN, E. ADLER, J. FREIDUS, and M. NEIMAND (J. Amer. Chem. Soc., 1937, 59, 179—181).—The system $\text{LiNO}_3\text{--Ca(NO}_3)_2$ shows a eutectic at 235.2° and 70% LiNO_3 . In the system $\text{LiNO}_3\text{--Ca(NO}_3)_2\text{--KNO}_3$ the eutectic temp. is 117.4° and the composition LiNO_3 23, $\text{Ca(NO}_3)_2$ 15, KNO_3 62%. E. S. H.

Temperature-concentration equilibria in the systems chloroform-chlorine and chloroform-bromine. Chloroform chlorinates. J. A. WHEAT and A. W. BROWNE (J. Amer. Chem. Soc., 1936, 58, 2410—2413).—The following compounds are formed: $(\text{CHCl}_3)_2\text{Cl}_2$ (m.p. -80.0°), CHCl_3Cl_2 (m.p. -96.5°), $\text{CHCl}_3\text{, } 2\text{Cl}_2$ (m.p. -112.5°), $\text{CHCl}_3\text{, } 3\text{Cl}_2$ (m.p. -115°). Br does not form compounds with CHCl_3 . E. S. H.

The system SO_2 -decalin. W. F. SEYER and W. F. CORNETT (Ind. Eng. Chem., 1937, 29, 91—92).—F.p. and complete miscibility temp. for decalin containing 72.5% of *trans* and 27.5% of *cis* forms are recorded. The crit. solution temp. is 41.8° . Since the f.p. of the two-liquid systems decrease with increase in mol.-% SO_2 , the solubilities of the two forms of decalin are different. R. C. M.

Thermal analysis of mixtures of ammonium nitrate, guanidine nitrate, and nitroguanidine. T. URBANSKI and J. SKRZYNECKI (Rocz. Chem., 1936, 16, 353—358).—Data for the binary eutectics are: NH_4NO_3 (I) 74, guanidine nitrate (II) 26%, f.p. 127.7° ; (I) 80, nitroguanidine (III) 20%, f.p. 131.5° , (II) 59, (III) 41%, f.p. 166.5° ; those for the ternary eutectic are: (I) 60, (II) 22.5, (III) 17.5%, f.p. 113.2° . R. T.

Thermal analysis of binary systems containing glyceryl trinitrate. I, II. J. HACKEL (Rocz. Chem., 1936, 16, 323—333, 366—376).—I. PhNO_2 ,

$m\text{-C}_6\text{H}_4(\text{NO}_2)_2$, $s\text{-C}_6\text{H}_3(\text{NO}_2)_3$, *o*-, *m*-, and *p*- $\text{C}_6\text{H}_4\text{Me}\cdot\text{NO}_2$, $s\text{-C}_6\text{H}_3\text{Me}(\text{NO}_2)_2$, tetryl, and hexogen yield simple eutectics with the two modifications of glyceryl trinitrate (I).

II. Et centralite forms an unstable 1 : 1 compound with the two modifications of (I), whilst binary systems of (I) with mannitol hexanitrate, erythritol tetranitrate, pentaerythritol tetranitrate, NHPh_2 , urethane, phenylurethane, phthalide, and Me centralite consist of simple eutectics. The systems (I)–camphor and –glycol dinitrate were only partly studied, owing to the high η and low velocity of crystallisation of the mixtures. R. T.

Thermal analysis of binary mixtures containing esters of nitric acid. IV. T. URBANSKI (Rocz. Chem., 1936, 16, 359—365).—The data suggest formation of unstable 1 : 2 compounds of mannitol hexanitrate (I) with PhNO_2 , *o*- $\text{C}_6\text{H}_4\text{Me}\cdot\text{NO}_2$, and Et *o*-nitrocinnamate, and of a 2 : 1 compound with Et *o*-nitrobenzoate. Simple eutectics are formed in the systems: (I)– $\text{NHPh}\cdot\text{CO}_2\text{Et}$, –erythritol tetranitrate– $s\text{-OEt}\cdot\text{C}_6\text{H}_2(\text{NO}_2)_3$, and pentaerythritol tetranitrate–*m*- $\text{NO}_2\text{-C}_6\text{H}_4\text{-NH}_2$ and – $\text{Me}_2\text{C}_2\text{O}_4$. R. T.

Activity of carbonyl groups of benzil in binary systems. K. HRYNAKOWSKI and H. STASZEWSKI (Rocz. Chem., 1936, 16, 388—394).—The systems benzil– PhOH , – NHPh_2 , –*o*- and –*m*- $\text{C}_6\text{H}_4(\text{OH})_2$ consist of unbroken series of practically ideal solutions. It is inferred that the residual valencies of the CO groups are not augmented by their proximity in benzil. R. T.

Equilibrium of reaction of nickel with carbon dioxide. A. F. KAPUSTINSKI and A. SILBERMAN (Acta Physicochim. U.R.S.S., 1936, 5, 605—616).—Equilibrium data for $\text{Ni} + \text{CO}_2$, $\text{NiO} + \text{CO}$ have been determined by the method previously described (A., 1936, 1464) between 600° and 1000° . The heat of formation, free energy, and entropy of NiO are calc. F. L. U.

System lime-boric oxide-silica. E. P. FLINT and L. S. WELLS (J. Res. Nat. Bur. Stand., 1936, 17, 727—752).—The phase diagram for the system $\text{CaO--B}_2\text{O}_3\text{--SiO}_2$ has been constructed. An area of liquid immiscibility extends across the diagram from the CaO--SiO_2 side to the $\text{CaO--B}_2\text{O}_3$ side, crossing the SiO_2 , $\text{CaO, } 2\text{B}_2\text{O}_3$, and $\text{CaO, B}_2\text{O}_3$ (I) regions. The existence of $5\text{CaO, B}_2\text{O}_3\text{, SiO}_2$ (II), m.p. 1419° , has been established. Solid solutions of (I), $2\text{CaO, B}_2\text{O}_3$, or (II) in 2CaO, SiO_2 (III) cause a max. lowering of 190° in the temp. at which $\alpha\text{--}\beta$ inversion of (III) occurs. C. R. H.

Electrolysis of sodium chloride in liquid ammonia. III. Solubility in the ternary system $\text{NaCl--NH}_4\text{Cl--NH}_3$. E. I. ACHUMOV and E. A. EZEROVA (J. Gen. Chem. Russ., 1936, 6, 1418—1429).—Phase diagrams are recorded for the interval -70° to 110° . Pt is appreciably sol. in $\text{NH}_3\text{--NH}_4\text{Cl}$ at $>80^\circ$. R. T.

System $\text{CaSO}_4\text{--H}_3\text{PO}_4\text{--H}_2\text{O}$. J. D'ANS and P. HOFER (Angew. Chem., 1937, 50, 101—104).—The (enhanced) solubilities of anhydrite and gypsum (at 25° and 83°) and of $\text{CaSO}_4\cdot 0.5\text{H}_2\text{O}$ (I) (at 83°) in $\text{H}_3\text{PO}_4\text{--H}_2\text{O}$ mixtures have been determined, and the

bearing of the data on the production of H_3PO_4 from $\text{Ca}_3(\text{PO}_4)_2$ is discussed. At 25° , anhydrite is stable when the solution contains > 83 g. of H_3PO_4 per 100 g. of H_2O , whilst at 83° it is stable over the whole range of solutions; owing to the great tendency to supersaturation, the solubilities of gypsum and (I) can, however, be determined at this temp. and the inversion point, above which (I) is the less sol., corresponds with 45 g. of H_3PO_4 per 100 g. of H_2O .

R. C. M.

System $\text{FeAsO}_4\text{--NaOH--H}_2\text{O}$. I. S. VEICHERTZ and I. V. KRASCHEVSKAJA (J. Appl. Chem. Russ., 1936, 9, 1909—1919).—The reaction $\text{FeAsO}_4 + 3\text{NaOH} \rightarrow \text{Fe}(\text{OH})_3 + \text{Na}_3\text{AsO}_4$ proceeds to completion at 90° when 6 mols. of NaOH are taken per mol. of FeAsO_4 , irrespective of the $[\text{NaOH}]$. When the ratio $\text{FeAsO}_4 : \text{NaOH} < 0.25$, the compounds $\text{Na}_6\text{Fe}(\text{AsO}_4)_3$, $\text{Na}_3\text{Fe}(\text{AsO}_4)_2$, and $\text{Na}_3\text{Fe}_2(\text{AsO}_4)_3$ appear to be formed.

R. T.

Thermal decomposition of ammonium-permutite, ammonium-bentonite, and ammonium-clay. O. BOTTINI (Kolloid-Z., 1937, 78, 68—71).—The % loss of NH_3 from NH_4 -permutite, -bentonite, and -clay has been measured at 50° intervals between 50° and 550° . Differences in the form of the curves point to structural differences between the three substances.

F. L. U.

Calculation of isothermals in quaternary systems. T. A. POPOVA (J. Phys. Chem. Russ., 1936, 8, 85—87).—A consideration of the isothermals in the system $\text{CaO} + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3 + \text{SiO}_2$.

E. R.

Solid phase rule (Bodenkorperregel) in the peptisation of metal oxides. N. F. JERMOLENKO (Kolloid. Shur., 1935, 1, No. 2, 16—27; cf. A., 1930, 158).—The peptisation of CuO in aq. NH_3 , of Ni_2O_3 and Fe_2O_3 in aq. HCl , and of PbO in aq. HNO_3 varies with the amount of the solid phase and the original concn. of the solution.

J. J. B.

Free energy of hydrogen cyanide from spectroscopic data. A. R. GORDON (J. Chem. Physics, 1937, 5, 30—32).—The free energy and heat content of gaseous HCN are calc. from spectroscopic data, and vals. for the equilibrium const. for the formation of gaseous HCN from its elements are recorded which are in good agreement with those of Lewis and Randall, but not with those of Badger. The equilibrium const. for the exchange reaction with D_2 is also given. The entropy of liquid HCN is computed.

W. R. A.

Latent energy of solid solutions. J. CICHOCKI (Compt. rend., 1937, 204, 233—234).—The latent energy is defined as the work required to compress the solute atoms into the space available in the solvent lattice. The lowering of the m.p. of Cu by dissolved Al , calc. on this basis, is in agreement with experiment.

A. J. E. W.

Association, heat of mixing, and miscibility gaps. K. L. WOLF (Trans. Faraday Soc., 1937, 33, 179—190).—Heats of dilution are discussed in reference to the formation of "mol. and supermol. solutions" and "mol. mixtures."

F. L. U.

Derivation of certain thermodynamic relations; a generalised equation of sorption and

a new equation of electrocapillarity. B. V. DERJAGUIN (Kolloid. Shur., 1935, 1, 217—222).—The changes of free energy associated with the movement of a sorbent in a gravitational field and of a double layer in an electrostatic field are calc. and the results discussed.

J. J. B.

Energy and entropy of hydration of organic compounds. J. A. V. BUTLER (Trans. Faraday Soc., 1937, 33, 229—236; cf. A., 1935, 441, 1067; 1936, 1205).—The free energy, heat (ΔH) and entropy (ΔS) of hydration of simple org. compounds in very dil. solution are discussed. The relation between ΔH and ΔS both for non-polar compounds and for aliphatic alcohols is linear, but the two lines do not coincide.

F. L. U.

Heat capacity of bound water and of soil. P. I. ANDRIANOV (Kolloid-Z., 1937, 78, 107—108).—The calc. sp. heat of H_2O in combination with MgSO_4 , CuSO_4 , CaSO_4 , and $\text{Na}_2\text{S}_2\text{O}_3$ is 0.4—0.8. Measurement of the sp. heat of dried and moist soils shows that the sp. heat of the hygroscopic H_2O is 0.70—0.75.

F. L. U.

Heats of dissolution and heats of reaction in liquid ammonia. F. C. SCHMIDT, J. SORTYSIAK, and H. D. KLUGE (J. Amer. Chem. Soc., 1936, 58, 2509—2510).—Mol. heats of dissolution of NH_4Cl , NH_4Br , EtOH , PbI_2 , HgI_2 , LiI , LiBr , RbBr , and $\text{C}_5\text{H}_5\text{N}$ in liquid NH_3 have been determined. The heat of dilution is negative for EtOH and positive for the NH_4 salts.

E. S. H.

Heat of hydrogenation of ethylene. F. D. ROSSINI (J. Res. Nat. Bur. Stand., 1936, 17, 629—638).—Thermal data for the combustion of H_2 , C_2H_4 , and C_2H_6 , and for the hydrogenation of C_2H_4 have been examined. The most trustworthy vals. for the reaction $\text{C}_2\text{H}_4(\text{gas}) + \text{H}_2(\text{gas}) \rightarrow \text{C}_2\text{H}_6(\text{gas})$ based on hydrogenation and combustion data, respectively, are -32.64 ± 0.06 and -32.78 ± 0.13 kg.-cal. per mol.

C. R. H.

Heat of reaction of the aldol condensation with [formation of] hexose-1-phosphoric acid. O. MEYERHOF and W. SCHULZ (Biochem. Z., 1936, 289, 87—96).—The heat of the enzymic reaction glyceraldehyde (I) + dihydroxyacetonephosphoric acid (II) \rightarrow hexose-1-phosphoric acid (III) is 15,000 g.-cal. per mol. (82 g.-cal. per g. of hexose) both for the synthesis of fructose 1-phosphate and for the mixture of *d*-fructose and *d*-sorbitol 1-phosphates. The heat of reaction of the chemical aldol condensation using (I) is 14,500 g.-cal. (81 g.-cal. per g.) and using $\text{CO}(\text{CH}_2\text{OH})_2$ 19,000 g.-cal. (106 g.-cal. per g.). The difference of 25 g.-cal. is the val. derived from the heat of combustion. Since the vals. for the synthesis of (III) correspond almost exactly with those for synthesis of hexose diphosphate from 2 mols. of (II) (14,000 g.-cal. per mol.) it follows that the intermediate reaction (II) glyceraldehydophosphoric acid is approx. thermoneutral.

P. W. C.

Conductance of aqueous solutions as a function of concentration. II. Potassium ferrocyanide. J. JONES and F. C. JELEN (J. Amer. Chem. Soc., 1936, 58, 2561—2565; cf. A., 1934, 491).—Data obtained at 0° and 25° for a wide range of

concn. have been applied to various equations already proposed. E. S. H.

Resistance and capacity behaviour of strong electrolytes in dilute aqueous solution. I. Simultaneous observation of conductance and dielectric constant at high radio frequencies. II. Dispersion of electrical conductance. O. M. ARNOLD and J. W. WILLIAMS (J. Amer. Chem. Soc., 1936, 58, 2613—2616, 2616—2624).—I. Apparatus of the comparator-resonance type is described and the theory of the circuits discussed.

II. Dispersion of electrical conductance has been studied in very dil. solutions of strong electrolytes of different valency types. The results agree with theory and indicate that interionic forces offer an adequate explanation of the behaviour of an ideal electrolyte. E. S. H.

Degree of dissociation of bi-bivalent salts in very dilute aqueous solution. E. A. O'CONNOR (Nature, 1937, 139, 151—152).—Conductivity data for aq. solutions of Ca and Sr dithionates and sulphates, and of their mixtures in which $S_2O_6^{2-}$ and SO_4^{2-} are the common negative ions, show that the corresponding Ca and Sr salts have practically the same Λ over the range 0.00005—0.001 equiv. The plot of Λ against (equiv. concn.)^{1/2} deviates from linearity only at the highest concn. but the slope of this line is \gg that predicted by Onsager's equation and salts with the higher Λ_∞ give the smaller slope, contrary to this equation. The conductivities of all the mixtures are additive, indicating complete dissociation. L. S. T.

Influence of carbamide and mannitol on the conductivity of potassium chloride. K. JABŁCZYŃSKI and Z. JAWORSKI (Rocz. Chem., 1936, 16, 411—415).—The conductivity of 0.5—2*N*-KCl is reduced by addition of $CO(NH_2)_2$ or mannitol, to an extent corresponding with the increased η of the solutions. It would seem that K^+ and Cl^- are not hydrated. R. T.

Conductivity of salts in *n*-propyl and iso-propyl alcohols. F. HOVORKA and J. C. SIMMS (J. Amer. Chem. Soc., 1937, 59, 92—95).—Data are recorded for KI, KBr, NaI, and NaBr as solutes. The calc. dissociation consts. show that these systems are weak electrolytes. The principle of additivity does not apply. E. S. H.

Constitution of organo-metallic bases and salts. K. A. JENSEN (Z. anorg. Chem., 1937, 230, 227—285; cf. this vol., 14).—Compounds of the type $R_{n-1}MX$ and $R_{n-1}MOH$ ($M = n$ -valent metal, $X =$ acid radical), although frequently designated "salts" and "bases," usually exhibit only slight conductivity in H_2O or $MeOH$. Ions are provided, not by direct dissociation, but by chemical interaction with the solvent (aquatisation, alcoholisation), e.g., $[SnMe_3OH] + H^+ \rightleftharpoons [SnMe_3H_2O]^+$; $[HgEtCl] + H_2O \rightleftharpoons [HgEtH_2O]^+ + Cl^-$. F. L. U.

Conductivity and cataphoretic speed measurements of benzopurpurin 4B, Congo-red, and sky-blue F.F. B. N. ACHARYA, A. M. PATEL, and B. N. DESAI (Proc. Indian Acad. Sci., 1936, 4, A, 503—513).—The influence of dye concn., dialysis,

and addition of NaCl and $BaCl_2$ has been studied. Changes in conductivity and cataphoretic speed are attributed to aggregation of the dye ions to form ionic micelles, and the dyeing of cotton fibre by substantive dyes is explained on this basis. R. S.

Influence of gelatin on transport numbers and conductivity of hydrochloric acid and potassium chloride. V. M. VDOVENKO and N. A. MALOV (J. Gen. Chem. Russ., 1936, 6, 1609—1614).—The transport no. u of Cl^- falls with increasing concn. of gelatin (I) to a const. val. at 1%, for 0.02*N*-HCl; for 0.1*N*-HCl it rises continuously, whilst for 0.1*N*-KCl max. u is obtained with 4% (I). The sp. conductivity of 0.02*N*-HCl and of H^+ falls to a const. val. at 3% (I), whilst that of Cl^- rises to a max. at 1% (I), and then falls to a const. val. at 3%. R. T.

Standard electrode potential of silver. J. J. LINGANE and W. D. LARSON (J. Amer. Chem. Soc., 1936, 58, 2647—2648).—Published data for the standard potential of the Ag-AgCl electrode and the activity product of AgCl lead to $E_{Ag, Ag^+}^0 = -0.7996$ volt. E. S. H.

Theory of metal potential. I. Local current theory of metal potential and its application to the electromotive behaviour of metals in oxygen-free solutions. II. Metal potential in oxygen-containing or oxidising solutions. W. J. MÜLLER (Monatsh., 1936, 68, 431—449; 69, 437—445).—I. The author's theory is applied to the explanation of anomalies presented by measurements of the potential at Cd, Fe, Ni, and Zn electrodes.

II. The theory is extended to cover depolarised electrodes. J. W. S.

Influence of electrolytes on electrification of water by atomisation. T. MALARSKI (Acta phys. polon., 3, 43—74; Chem. Zentr., 1936, i, 1810—1811).—Small amounts of electrolytes have a considerable influence on the atomisation potential; cations and anions exert a sp. effect in the same sense as that shown in electrokinetic phenomena. A tentative relation is derived between electrolyte concn. and the double layer potential. J. S. A.

Diffusion potentials. I. Measurements relating to concentration-elements. II. Maxima and minima in the diffusion of a mixture of electrolytes. J. J. HERMANS (Chem. Weekblad, 1937, 34, 25—27).—The problem of diffusion potential is discussed and certain conclusions are checked by diffusion measurements in dil. HCl, NaCl, and $BaCl_2$ solutions. Max. and min. effects are readily observed in the diffusion of 0.01—0.1*N*-NaCl in 1% agar into NaOH (phenolphthalein indicator) and 0.01*N*-HCl in 2% agar into H_2O (indigocarmine indicator). S. C.

Potentials at the interface of two liquid phases. IV. K. KARCEWSKI (Rocz. Chem., 1936, 16, 348—352).—The potential ϵ at the interface aq. KCNS-Bu^oCO₂H becomes more positive with increasing [KCNS] up to 0.1*N*, and then falls gradually; in the case of $CH_3Ac \cdot CO_2Et$ a max. is attained at 0.01*N*-KCNS. In the systems aq. KCNS-Bu^oOH, -Bu^oOH, -iso-C₄H₉OH, and -EtOAc, ϵ falls continuously with rising [KCNS]. R. T.

Potential difference at an air-water interface. J. A. CHALMERS and F. PASQUILL (Phil. Mag., 1937, [vii], 23, 88—96).—A val. of 0.26 volt has been obtained for the sum of the p.d. at H_2O -air, air-wet filter-paper, and filter-paper- H_2O interfaces. The individual vals. for the two last interfaces are supposed to be zero owing to the random orientation of the H_2O mols., and the val. 0.26 volt thus represents the d. at the H_2O -air interface; this is probably due to a surface double layer of oriented H_2O mols.

A. J. E. W.

Cells with dissimilar electrodes. (MLLE.) S. VEIL (Compt. rend., 1937, 204, 242—244; cf. A., 1935, 1462).—The effect of oxidising or amalgamating the electrodes on the e.m.f. of the cell metal I- H_2O -metal II is discussed. The e.m.f. of the cell $Zn-Na_2S$ (sat.)-gelatin- $Fe(NO_3)_3$ (sat.)-Pt is 2.05 volts.

A. J. E. W.

Oxidation-reduction potentials of thiol compounds derived from thermal data. H. BOR-SOOK, E. L. ELLIS, and H. M. HUFFMAN (J. Biol. Chem., 1937, 117, 281—308; cf. A., 1935, 304).—The oxidation-reduction potentials of the systems cystine (I) \rightleftharpoons cysteine (II) and dithiodilactic acid thiolactic acid have been calc. The vals. previously obtained by direct measurement for the (I) \rightleftharpoons (II) system are not characteristic. The reduction of indigotindisulphonate by (II) is catalysed by SeO_2 , which yields a cryst. compound with (II), but not by salts of Fe, Cu, Co, Ni, or Mg.

W. McC.

Oxidation-reduction potentials of 2-hydroxyphenazine and 2-keto-10-methyl-2:10-dihydrophenazine [N-methylaposafranone]. P. W. PREISLER and L. H. HEMPELMANN (J. Amer. Chem. Soc. 1937, 59, 141—144).—The oxidation-reduction potentials of 2-hydroxyphenazine and methylaposafranone (I) (Kehrmann and Cherpillod, A., 1925, i, 302) are determined electrometrically. Both systems show the two-step process below p_H 3 and a transformation into an apparent one-step process above p_H 3. (I) is suggested as an indicator for determination of p_H (2—4) and oxidation-reduction potentials.

H. B.

Oxidation-reduction potential of reductic acid. (MME.) N. MAYER (Compt. rend., 1937, 204, 115—117).—The oxidation of reductic acid to oxyreductic acid is a reversible process; the val. of E_0 is $+0.467 \pm 0.005$ volt at 23° .

A. J. E. W.

Oxidation-reduction equilibrium. I, II. L. BRÜLL (Annali Chim. Appl., 1936, 26, 437—442, 443—450).—I. The potential associated with two reversible oxidation-reduction systems in equilibrium is discussed theoretically.

II. The experimental results for the system benzoquinone-quinol-chlorobenzoquinone-chloroquinol are in good agreement with calc. vals.

L. A. O'N.

Hydrogen overvoltage and the reversible hydrogen electrode. J. A. V. BUTLER (Proc. Roy. Soc., 1936, A, 157, 423—433).—When the adsorption energy of H atoms on a metallic cathode is appreciable, these can be deposited at a lower potential than "free" H, liberated according to Gurney's mechanism (A., 1932, 25). At a certain p.d. the rates

of transfer of H ions to adsorption positions and of the reverse process are equal, and the activation energy of the reversible transfer may be low enough to give rise to a reversible electrode. H cannot be continuously liberated in this way unless the rate of desorption as H_2 mols. is $>$ the rate of electrolytic separation.

L. L. B.

Overvoltage of hydrogen at mercury. S. VON NARAY-SZABÓ (Naturwiss., 1937, 25, 12—13).—The overvoltage, e , at a pure Hg cathode is given by $e = a + b \log i$ (in which a and b are consts. and i is the c.d.). For $2N-HCl$, a varies from -0.484 to -0.582 volts and for $2N-H_2SO_4$ it is -1.044 volts, whilst b varies from -0.072 to -0.126 for $2N-HCl$, and from -0.055 to 0.075 for $2N-H_2SO_4$. Traces of As_2O_3 cause a considerable increase in e , and the curve is no longer linear. O_2 affects e similarly, but traces of Pt are without effect.

A. J. M.

Concentration polarisation in the electrolysis of water. P. I. SOKOLOV [with Z. F. LEVISSON] (J. Gen. Chem. Russ., 1936, 6, 1721—1728).—Concn. polarisation in the electrolysis of aq. solutions, as measured by means of an auxiliary gas electrode fitted to the working electrodes, can be almost completely eliminated at the cathode, and partly so at the anode, by adequate circulation of the electrolyte. The aggregate polarisation potential in electrolysis of 30% KOH (c.d. 500—5000 amp. per sq. m.) varies from 0.151 to 0.183 volt, pointing to the existence of very considerable differences in $[OH']$ at the cathode and anode.

R. T.

Cathode polarisation in precipitation of zinc from solutions of its simple salts. O. ESSIN and A. LEVIN (J. Gen. Chem. Russ., 1936, 6, 1539—1548).—The expression $E - k \log D$, where E is the cathode polarisation potential, k is a const., and D is the c.d., is shown to hold for $0.5-1.0N-ZnSO_4$ in $0.1-0.3N-H_2SO_4$, at c.d. >0.1 amp. per sq. cm., if corrections are made for the effects of dissolution of Zn at the cathode, and for the polarisation potential of H_2 . At very low c.d. (<0.01 amp. per sq. cm.) an additional potential of about 0.06 volt appears.

R. T.

Cathodic polarisation in the deposition of copper and zinc from solutions of complex cyanides. O. ESSIN and E. ALFIMEEVA (J. Phys. Chem. Russ., 1936, 8, 137—146).—Experiments relating to the deposition of Zn from $K_2Zn(CN)_4$ show that the cathodic polarisation is entirely of the concn. type. The same conclusion follows from observations on the deposition of Cu from $CuCN + 1.5$ or $2KCN$, if it is assumed that the only anions present in the solutions are CN' and $Cu(CN)_2$.

E. R.

Simultaneous discharge of cadmium and hydrogen ions from solutions of complex cyanide salts. O. ESSIN and T. BEKLEMISHEVA (J. Gen. Chem. Russ., 1936, 6, 1602—1608).—The cathode potential-c.d. curves obtained in electrolysis of $0.1M-K_2Cd(CN)_4 + 0.05M-KCN$ can be explained in terms of concn. polarisation, due to changes in the concn. of the cation. Discharge of H^+ at the cathode takes place in accordance with the equation of Erdey-Gruz and Volmar (A., 1930, 1376).

R. T.

Concentration polarisation in fused salts. S. KARPATSCHEV and S. REMPEL (*J. Phys. Chem. Russ.*, 1936, 8, 134—136).—The existence of concn. polarisation in fused electrolytes is shown by a comparison of the current-potential curves of fused $\text{KCl} + \text{LiCl}$ with and without stirring. E. R.

Passivity of iron and steel in nitric acid solution. XIII. Y. YAMAMOTO (*Bull. Inst. Phys. Chem. Res. Japan*, 1936, 15, 1257—1284; cf. A., 1936, 938).—It is suggested that passivity occurs when the dissolution potential of Fe in aq. HNO_3 exceeds the decomp. voltage of the solution. This has been confirmed by increasing or decreasing the decomp. voltage by addition of $\text{CO}(\text{NH}_2)_2$ and NaNO_2 or AgNO_3 , respectively. R. S.

Passivity of chromium. V. E. MÜLLER and V. CUPR (*Z. Elektrochem.*, 1937, 43, 42—52; cf. A., 1936, 800).—The conditions for the activation of passive Cr in acids by cathodic polarisation and for the passivation of active Cr by anodic polarisation have been determined. The influence of the anion is discussed. E. S. H.

Principle of polarographic measurements. A. H. W. ATEN (*Chem. Weekblad*, 1937, 34, 22—23).—An explanation is given of the method of measuring concn. of ions by use of the dropping Hg electrode. S. C.

(A) Sound-sensitive state of certain metallic electrodes. (B) Influence of concentration of electrolyte on sound-sensitivity of platinum electrodes. L. V. NIKITIN (*J. Gen. Chem. Russ.*, 1936, 6, 1393—1400, 1401—1403).—(A) The electrode potential at which cathodes in 0.001N-HCl exhibit sensitivity to acoustic waves (cf. A., 1935, 306) in the electrolyte varies with the nature of the cathode (Pt, Pb, Cu, Fe, Al), with the duration of electrolysis, and with the c.d. The anode does not take any part in the phenomenon.

(B) With a Pt cathode in 0.0001—0.2N-HCl the min. and max. c.d. at which acoustic effects are obtained run parallel with the [HCl]. R. T.

Theory of unimolecular reactions. L. LANDAU (*Physikal. Z. Sovietunion*, 1936, 10, 67—77).—The transition from unimol. to bimol. reaction type with decrease in the pressure is studied in terms of the entropies of the reactants. R. S. B.

Combustion levels. W. T. DAVID (*Nature*, 1937, 139, 67—68).—A discussion. L. S. T.

Influences of dilution on the explosive combustion of hydrocarbons. W. A. BONE and L. E. OUTRIDGE (*Proc. Roy. Soc.*, 1936, A, 157, 234—248).—The effects of dilution with He, A, and N_2 , respectively, on explosions of $\text{C}_2\text{H}_4 + \text{O}_2$ (I) and $\text{C}_2\text{H}_2 + \text{O}_2$ (II) mixtures have been studied. Combined chemical, photographic, and spectrographic evidence is adduced to show that, whereas there is neither H_2O formation nor C separation during the undiluted explosions, progressive dilution beyond a point at which the mean flame temp. becomes $< 2000^\circ$ may induce both. This effect is more marked in (I) than in (II), and with N_2 than with A or He as diluent. It is probably due to the fall in flame temp. induced by dilution. L. L. B.

Slow combustion of benzene. J. AMIEL (*Ann. Chim.*, 1937, [xi], 7, 70—120; cf. A., 1936, 684, 939).—The slow combustion of $\text{C}_6\text{H}_6 + 7.5\text{O}_2$ mixtures at 1 atm. pressure in sealed Pyrex tubes has been studied. Below 400° reaction is very slow, but at $> 565^\circ$ the mixture explodes. The % of CO_2 in the products after 2 hr. increases steadily with rise of temp., and at 473° becomes equal to the % of CO, which attains a max. at 476° . The whole of the C_6H_6 is oxidised after 2 hr. at 510° and combustion of the CO is complete at 575° . Analytical data are given showing the variation in the % of CO, CO_2 , and O_2 with time, and triangular diagrams have been constructed. The reaction velocity is a const. for a considerable fraction of the total time and varies with the temp. according to $\log_e V = -28300/T + 41.95$. PhOH and traces of benzoquinone are formed but aldehydes and peroxides could not be detected. R. S.

Influence of dissociation on flame temperatures. L. REINGOLD (*Chaleur et Ind.*, 1935, 16, 275—284, 463—472; *Chem. Zentr.*, 1936, i, 1821).—The effect on temp. of combustion of thermal dissociation processes occurring between 1500° and 2000° is calc. J. S. A.

Action of oxygen in polymerisation reactions. H. DOSTAL and H. MARK (*Oesterr. Chem.-Ztg.*, 1937, 40, 50—51).—In the polymerisation of vinyl derivatives an induction period, of the same order as the mean time of growth of a single polymeride chain, is observed only in presence of O_2 . O_2 is considered to increase the mean time of growth of chains by hindering the intramol. or intermol. chain-breaking processes. J. S. A.

Reactions of sodium atoms with oxides of nitrogen. C. E. H. BAWN and A. G. EVANS (*Mem. Manchester Phil. Soc.*, 1935—1936, 80, 1—6).—The rate of reaction between Na vapour and NO_2 is 4 times that between Na and N_2O . The primary reaction is $\text{Na} + \text{N}_2\text{O}(\text{or } \text{NO}_2) \rightarrow \text{NaO} + \text{N}_2(\text{or } \text{NO})$. To secondary reactions between NaO and Na vapour is attributed the chemiluminescence which accompanies the reaction, and which for NO_2 is $<$ for N_2O on account of quenching by the NO formed. The chemiluminescence with N_2O is decreased by raising the temp. of the reaction zone. The reaction between Na vapour and NO is termol. and is not chemiluminescent. C. R. H.

Kinetics of gaseous addition of halogen acids to isobutene. G. B. KISTIAKOWSKY and C. H. STAUFFER (*J. Amer. Chem. Soc.*, 1937, 59, 165—170).—The gaseous thermal decomp. of $\text{Bu}^\gamma\text{Br}$ at $509\text{—}564^\circ$ abs. is a homogeneous unimol. reaction, with the rate const. $k = 10^{13.3 \pm 0.4} e^{-(40,500 \pm 1000)/RT}$ sec.⁻¹ The equilibrium of $\text{Bu}^\gamma\text{Br}$ and $\text{Bu}^\gamma\text{Cl}$ with isobutene and the respective halogen acid has been investigated at $361\text{—}533^\circ$ abs. The heats of reaction, free energy changes, and rate equations of the association reactions have been determined. The isomerisation of $\text{Bu}^\gamma\text{Cl}$ to Bu^βCl at 270° is $< 7.8\%$ at equilibrium.

E. S. H.

Thermal decomposition of gaseous silicon tetramethyl. D. F. HELM and E. MACK, jun. (*J. Amer. Chem. Soc.*, 1937, 59, 60—62).—At $659\text{—}717^\circ$

the reaction is homogeneous and unimol. at pressures >10 cm.; at lower pressures it is of a higher order. The energy of activation is about 79,000 g.-cal.; the velocity coeff. is given by $\log_e k = 35.03 - 78,800/RT$. A deposit of Si and C is produced during decomp.

E. S. H.

Primary processes in the thermal decomposition of butane.—See B., 1937, 20.

Introduction of radioactive halogen into organic molecules. N. BREJNEVA, S. ROGINSKI, and A. SCHILINSKI (*Acta Physicochim. U.R.S.S.*, 1936, 5, 549—574).—Exchange reactions with $AlBr_3$ containing one radioactive Br are applied to the introduction of radioactive Br into Br_2 , HBr , and org. bromides. The velocity of exchange increases with rise of temp., and is slower for aromatic than for aliphatic bromides. Similar exchange reactions with chlorides and iodides have also been investigated.

C. R. H.

Reaction kinetics of mixed polymerisations. H. DOSTAL (*Monatsh.*, 1936, 69, 424—426).—The kinetics of the production of polymerides from two or more different initial products are developed.

J. W. S.

Effect of structure on the reactions of organic compounds. Benzene derivatives. L. P. HAMMETT (*J. Amer. Chem. Soc.*, 1937, 59, 96—103).—The effect of a *m*- or *p*-substituent in the C_6H_6 ring on the rate or equilibrium of a reaction in which the reacting group is in a side-chain attached to the ring is given by $-RT \log_e K + RT \log_e K^0 = \Delta F = (A/d^2)(B_1/D + B_2)$, where K is a rate or equilibrium const. for a substituted reactant, K^0 that for the unsubstituted reactant, ΔF a free energy change, d the distance from the substituent to the reacting group, D the dielectric const. of the medium, and A , B_1 , and B_2 are consts. independent of temp. and solvent. The formula agrees with the theory that a substituent acts by internal electron displacement. Tables of substituent and reaction consts. are given, from which the effects of many substituents can be calc.

E. S. H.

Kinetics of the oxidation of ferrous ions by nitric acid. E. ABEL (*Monatsh.*, 1936, 68, 387—393).—Oxidation of Fe^{++} by HNO_3 occurs through formation of HNO_2 , and comprises successive reactions between HNO_3 and Fe^{++} , HNO_2 , Fe^{++} , and H^+ , HNO_2 , H^+ , and NO_2 , and NO_2 and Fe^{++} . The velocity coeffs. of these reactions have been determined.

J. W. S.

Reaction between osmium tetroxide and hydrobromic acid. II. Rate study. H. D. KIRSCHMAN and W. R. CROWELL (*J. Amer. Chem. Soc.*, 1937, 59, 20—23; cf. A., 1933, 351).—The reaction kinetics have been investigated at 100° in 1.2—3.5*M*- HBr . The reaction in the rate-determining step is of the first order with respect to each of the reacting constituents. A mechanism for the steps in the initial stages of the reaction is proposed.

E. S. H.

Influence of neutral salts on the velocity of esterification and viscosities in ethyl-alcoholic hydrochloric acid. A. KAILAN and W. MELZER (*Monatsh.*, 1936, 69, 377—398).—The viscosity (η)

and velocity of esterification (v) at 25° have been determined for $BzOH$ solutions in $N/3$ and $2N/3$ HCl in $EtOH$, to which various amounts of $LiCl$, $CaCl_2$, or $HgCl_2$ are added. In a first approximation, the results may be explained by assuming that v is decreased by the increase in η . In $EtOH$ almost free from H_2O the addition of salts only increases η , but in presence of H_2O , neutral salts, through hydrate formation, decrease the retarding action of the H_2O . Increase in the $[H_2O]$ and decrease in the $[HCl]$ favours the increase in sp. conductivity of the $EtOH$ solution through addition of these salts. $HgCl_2$ has the least effect of the salts investigated.

J. W. S.

Organic reactions. Velocity as a means of appreciating steric molecular constitution. J. RODRIGUEZ VELASCO and J. R. DE LA BORBOLLA (*Anal. Fis. Quím.*, 1936, 34, 603—636; cf. A., 1936, 940).—The velocities of hydrolysis of $AcCl$ (I) and $CH_3Cl \cdot COCl$ (II) have been determined in C_6H_6 , $PhMe$, and xylene at 15 — 35° and the relation $k_1/k_2 = (K_2/K_1)^{1/2}$ is confirmed. From the energies of activation and reaction coeffs. it is shown that (I) and (II) have the same functional steric hindrance to hydrolysis. Within certain limits the dilution does not influence the velocity of hydrolysis. Substitution of D_2O for H_2O has no effect, showing that the H^+ do not catalyse the reactions. L. A. O'N.

Kinetics of addition of bromine to ether. A. S. SELIVANOVA and J. K. SYRKIN (*J. Phys. Chem. Russ.*, 1936, 8, 48—50).— Br dissolved in CCl_4 reacts with Et_2O ; the additive product is a brown liquid immiscible with CCl_4 . By titrating the Br remaining in CCl_4 after different times and correcting for solubility of the bromide in CCl_4 , fairly const. vals. are obtained for the reaction velocity coeffs. at 15° , 20° , and 25° . The activation energy is 19 kg.-cal. (27 kg.-cal. if calc. by a formula taking into account the change in η); the non-exponential term is 3.5×10^9 (or 9.5×10^{10}), corresponding with a steric factor $\sim 10^{-2}$. The reaction is thus a "normal" one. Addition of I accelerates the reaction. E. R.

p_H of sugar solutions and hydrolytic power.—See B., 1937, 75.

Kinetics of the oxidation of copper at high temperatures. G. VALENSI (*Compt. rend.*, 1936, 203, 1354—1356; cf. A., 1936, 1085).—Measurements of the rate of oxidation of Cu sheets to CuO (270 — $950^\circ/760$ mm.) are recorded. During the initial formation of Cu_2O and CuO the square of the O_2 absorbed \propto the time. As soon as the Cu has disappeared the rate becomes slower. In the first stage of the reaction the effect of temp. is not in accordance with Arrhenius' law.

H. J. E.

Optimum chemical reactivity of adsorbed gases at their critical temperatures. G. EMSCHWILLER (*Compt. rend.*, 1936, 203, 1070—1072).—Factors influencing the velocity of reactions involving adsorbed gases are discussed. Changes in the velocity at the crit. temp. of the adsorbed gas may be due to change in its state.

A. J. E. W.

Reaction of sodium nitrite with nitrogen oxides. E. G. SEDASCHOVA (*Ukrain. Chem. J.*,

1936, 11, 327—333).—The rate increases with the $[\text{NO}_2]$ of the gas. The optimum temp. is 20—40°.

J. J. B.

Chlorination of ferric oxide in presence of carbon. A. V. PAMFILOV and E. G. SOHTANDEL (J. Gen. Chem. Russ., 1936, 6, 1639—1640).—Formation of FeCl_3 from Fe_2O_3 -C mixtures commences at 200°, and proceeds rapidly at 280°, at a rate \propto rate of flow of the Cl_2 .

R. T.

Kinetics of dissolution of zinc oxide in sulphuric acid. A. N. KRESTOVNIKOV and E. A. DAVIDOVSKAJA (J. Phys. Chem. Russ., 1936, 8, 77—84).—Pressed tablets of ZnO ($2 \times 2 \times 1.6$ cm.), with five sides covered by paraffin, are exposed to H_2SO_4 and the consts. K of Boguski's equation $K = (2.303v/tF) \log [c/(c-x)]$ are calc. (c = initial concn. of acid, x = concn. of ZnO in solution at time t , v = vol., F = surface). $K \propto$ the velocity of stirring. It decreases steadily with increase in concn. of H_2SO_4 . This can be accounted for by changes in activity and in η . K increases linearly with temp. All results agree with the assumption that diffusion is the process determining the dissolution velocity.

E. R.

Velocity of interaction of sulphuric acid with zinc in water and in ether solution. L. E. SABININA (J. Phys. Chem. Russ., 1936, 8, 165—180).—"Reduced conductivity" (ϵ_r = conductivity \times viscosity) is calc. for different mixtures ($\text{Et}_2\text{O} + \text{H}_2\text{SO}_4$, $\text{H}_2\text{O} + \text{H}_2\text{SO}_4$). A sharp max. of ϵ_r occurs in Et_2O at 92% H_2SO_4 , and two max. (at 20% and 50—60% H_2SO_4) in H_2O . The dissolution velocity of Zn in these solutions is determined by measuring the vol. of H_2 evolved (H_2O solutions) or by measuring the change in conductivity due to a decrease in concn. of free acid (Et_2O solutions). Max. of the initial dissolution velocity correspond with the max. of ϵ_r . It is assumed that both max. are due to max. in the concn. of complex ions $[\text{Et}_2\text{O}, \text{H}]^+$ and $[\text{H}_2\text{O}, \text{H}]^+$.

E. R.

Rate of dissolution of magnesium in acids. C. V. KING and W. H. CATHOART (J. Amer. Chem. Soc., 1937, 59, 63—67).—The rate of dissolution of Mg cylinders, rotating with a peripheral speed of 2000 cm. per min., has been determined in 12 acids in presence of Mg salts. The results are correlated with determinations of the diffusion coeffs. of the same acids, alone and with Mg salts, in a porous-glass disc type of diffusion cell.

E. S. H.

Corrosion of zinc and low-copper-zinc alloys.—See B., 1937, 48.

Combustion rate of carbon. Study of gas-film structure by micro-sampling.—See B., 1937, 8.

Activity of cokes towards carbon dioxide.—See B., 1937, 8.

Kinetics of an esterification reaction in benzene. M. M. DAVIES (Trans. Faraday Soc., 1937, 33, 331—336).—The kinetics of the $\text{BzOH} \cdot \text{CH}_2\text{Ph} \cdot \text{OH}$ esterification, in C_6H_6 solution and catalysed by $p\text{-C}_6\text{H}_4\text{Me} \cdot \text{SO}_3\text{H}$ (I), have been investigated at 74.3°, 100°, and 137°. The results accord with the view that only the monomeric mols. of the reactants are kinetically active. The great catalytic activity of

(I), relative to that of HClO_4 , HBr , or picric acid, is attributed to its labile nature.

J. W. S.

Autocatalytic increase in rate of ester hydrolysis by pancreatic lipase.—See A., III, 96.

Antioxidants and autooxidation of fats. VII. Classification of inhibitors.—See B., 1937, 57.

[Lubricating] oil oxidation.—See B., 1937, 12.

Atomic interchange between water and saturated hydrocarbons. C. HORREX and M. POLANYI (Mem. Manchester Phil. Soc., 1935—1936, 80, 33—35).—When heated for 10—20 hr. with D_2O at 90—100°, in presence of a Pt catalyst, 30—40% of the H atoms in cyclohexane or *iso*- C_5H_{12} are replaced by D . The rate of interchange is $>$ with D_2 , or the reverse of what is observed with unsaturated and aromatic compounds.

C. R. H.

Synthesis of sodamide from its elements, and its thermal decomposition. I. K. SAKURAZAWA and R. HARA (J. Soc. Chem. Ind. Japan, 1936, 39, 491B).— Na , N_2 , and H_2 , at pressures >30 —50 atm., and at 350—450°, react in presence of Fe catalysts to form NaNH_2 , 93% of the Na being changed under the most favourable conditions.

C. R. H.

Minimum amounts of catalysts which give a maximum effect in concentrated sulphuric acid. J. MILBAUER (Coll. Czech. Chem. Comm., 1936, 8, 543—554).—The effect of Pt on the reaction of H_2 with hot conc. H_2SO_4 increases at first linearly with $[\text{Pt}]$, but reaches a max. above 2 mg. per 100 c.c. The rate of oxidation of CO by H_2SO_4 at 250° \propto the at. concn. of Ru , Rh , Pd , Os , Ir , or Pt . Sol. sulphate catalysts tend to separate from the hot H_2SO_4 as a melt, and the rate of the catalysed reaction then tends to a limit. SiO_2 and tungstic acid act as catalysts in virtue of their large surface, but V_2O_5 and MoO_3 are reduced and catalyse the reactions in H_2SO_4 .

E. S. H.

Contact activity of chromium oxide in oxidation of sulphur dioxide.—See B., 1937, 133.

Influence of carriers on catalysts. P. J. IVANIKOV (J. Gen. Chem. Russ., 1936, 6, 1462—1469).— Cu catalysts of the reaction $\text{EtOH} \rightarrow \text{MeCHO} + \text{H}_2$, prepared from pure CuO , or from $\text{Cu}(\text{OH})_2$ pptd. on C , are unstable, changing their activity during the reaction. Adadurov's theoretical conclusions (J. Phys. Chem. Russ., 1933, 4, 907), based on the action of this catalyst, are questioned on this ground (see following abstract).

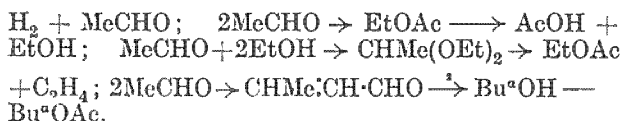
R. T.

Influence of the carrier on which the catalyst is deposited on the direction of reactions. I. E. ADADUROV, I. I. RIVLIN, and H. M. KOVALEV (J. Phys. Chem. Russ., 1936, 8, 147—158; see preceding abstract).—The change in the relative yields of NO and N_2 by oxidation of NH_3 on a Pt catalyst deposited on BeSO_4 , MgSO_4 , CaSO_4 , SrSO_4 , and BaSO_4 , at 450°, 550°, 650° and 750°, has been measured. The relative quantities of NO decrease from 80—97% with BaSO_4 to $\sim 50\%$ with BeSO_4 . This is attributed to a decrease in the "strength" of the catalyst by the electric fields of the smaller ions.

E. R.

Synthesis of esters by dehydrogenation of alcohols. II. Preparation of catalysts, and

influence of activators. IV. Preparation and regeneration of catalysts. B. N. DOLGOV and M. M. KORON (J. Gen. Chem. Russ., 1936, 6, 1444—1451, 1456—1461).—II. The most active Cu-Ce catalyst is obtained by adding conc. aq. NaOH to aq. $\text{Cu}(\text{OAc})_2$ containing 0.2% of $\text{Ce}(\text{NO}_3)_3$, at 40°, and washing the ppt., which is dried at 110° and reduced in H_2 . Pptn. on active C containing no Fe augments, and pptn. on Fe-containing C, SiO_2 gel, pumice, kieselguhr, or kaolin diminishes, activity. The yield of EtOAc obtained at 275° in presence of a series of Cu catalysts rises in the order Cu + 5% Ag, 1% V, 2% MnO, 10% MgO, 0.2% Ti, 0.2% Ce + 2% Mn, 0.5% Fe, 0.5% Zn, 0.2% Y, 1% Ti, 0.2% La, 1% Ni, Cu alone, 2% Cr_2O_3 , 0.2% Th, 0.2% Ce + 1% Ni, 0.2% Ce, 0.1% Th, 5% Al_2O_3 , 1% TiO_2 , 0.2% Ce + 0.2% Ni, 1% Co, 0.2% Ce + 5% Al_2O_3 . The yields of EtOAc are reduced by presence of H_2O , AcOH, or MeCHO, but not EtOAc, in the reaction mixture. The process is represented as $\text{EtOH} \rightarrow$



IV [with N. V. SIDOROV]. Inactivated catalyst, Cu, or Cu containing 0.2% of Ce or 0.9% of Zr is fused with an equal wt. of Al at 600—800°, and the powdered alloy is treated with 10% NaOH at 100° to complete extraction of Al. The resulting catalysts give EtOAc in 50% yield at 275°. R. T.

Catalytic hydrolysis of ether. N. KOZLOV and N. GOLUBOVSKAJA (J. Gen. Chem. Russ., 1936, 6, 1506—1509).—The activity of a no. of catalysts in the reaction $\text{Et}_2\text{O} + \text{H}_2\text{O} \rightarrow 2\text{EtOH}$, at 280—350°, rises in the series: $\text{Fe}_2\text{O}_3 < \text{ZnO} < \text{MgO} < \text{Al}_2\text{O}_3 < \text{Al}_2\text{O}_3\text{-ZnO} < \text{Al}_2\text{O}_3\text{-MgO} < \text{Al}_2\text{O}_3\text{-Fe}_2\text{O}_3$. Of these catalysts, Al_2O_3 is the most active in the reaction $\text{Et}_2\text{O} \rightarrow 2\text{C}_2\text{H}_4 + \text{H}_2\text{O}$. R. T.

[Catalytic] synthesis of methyl alcohol at low pressures.—See B., 1937, 116.

[Catalytic] gasoline synthesis from carbon monoxide and hydrogen.—See B., 1937, 108.

[Catalytic] preparation of acetylene from methane.—See B., 1937, 106.

Catalytic reactions of carbon with steam-oxygen mixtures.—See B., 1937, 8.

Electrolytic preparation of lead and zinc from their sulphides. N. A. IZGARISCHEV and N. K. GRIGORIEV (J. Gen. Chem. Russ., 1936, 6, 1676—1685).—Pb or Zn is obtained in good yield by electrolysis of suspensions of PbS or ZnS in 1:1 KCl-NaCl at 740—768° (cathode c.d. 0.14 and 0.51 amp. per sq. cm. for Pb and Zn, respectively). The process consists probably in liberation of Na at the cathode, followed by $2\text{Na} + \text{PbS}(\text{ZnS}) \rightarrow \text{Na}_2\text{S} + \text{Pb}(\text{Zn})$. R. T.

Electrodeposition of copper and zinc.—See B., 1937, 52.

Electrolytic separation of bivalent ytterbium. A. BRUKL (Angew. Chem., 1937, 50, 25—29).—Rare earths, freed from other metals, are converted into

sulphates and electrolytically reduced with a Hg cathode and a C anode, the latter immersed in a porous cell containing dil. H_2SO_4 . The electrolyte contains sulphates 120 and H_2SO_4 50 g. per litre, and the temp. is maintained at $>20^\circ$. With a c.d. of 0.05 amp. per sq. cm., YbSO_4 of high purity is pptd. The mother-liquor can be further electrolysed after the addition of pptd. SrSO_4 , when YbSO_4 is deposited in the SrSO_4 . The mixed sulphates are ignited, the YbSO_4 forming Yb_2O_3 which is dissolved in conc. HCl and so separated from the SrSO_4 . Traces of Sr can be removed by the addition of dil. H_2SO_4 which ppts. SrSO_4 on long keeping. The solubility of YbSO_4 at 17° in 0.2N, N-, and 2.5N- H_2SO_4 is 4, 8, and 20 g. per litre, respectively. A method is outlined for the determination of Yb by electrolytic reduction, oxidising the Yb^{++} with $\text{NH}_4\text{Fe}(\text{SO}_4)_2$, and titrating the Fe^{++} so produced with KMnO_4 . The application of electrolytic reduction to the separation of Lu and Tu from Yb is described. C. R. H.

Electrolysis of ferrous chloride, bromide, and iodide and of ferric chloride in mixtures of water and ethyl alcohol. C. CHARMETANT (Compt. rend., 1936, 203, 1345—1347; cf. A., 1935, 1086).—In the electrolysis of FeCl_2 , FeCl_3 and MeCHO are formed at the anode, the FeCl_3 yield being a min. for an [EtOH] of 450 g. per litre. The Fe formed at the cathode decreases and the H_2 liberated increases with increasing c.d. In electrolysing FeBr_2 all of the Br liberated forms FeBr_3 . No EtOH is oxidised. I is liberated at the anode from FeI_2 , and dissolves. For FeCl_3 at a moderate [EtOH] all of the Cl liberated oxidises EtOH. Pure Fe is deposited at the cathode after several hr., and with a high c.d. and [EtOH]. The adherence is very poor. H. J. E.

[Electro-]deposition of nickel.—See B., 1937, 146.

Electro-deposition of manganese.—See B., 1937, 146.

Electrolysis of manganese solutions.—See B., 1937, 52.

Electrolytic preparation of magnesium hydroxide.—See B., 1937, 33.

Electrochemical oxidation of ϕ -cumene.—See A., II, 92.

Electrolysis of mixtures of propionates with sulphates and with perchlorates.—See A., II, 84.

Possibility of a selective effect of high-frequency fields in flames. A. E. MALINOVSKI (Physikal. Z. Sovietunion, 1936, 9, 264—267; cf. A., 1935, 708).—When a const. electric field is applied to a flame the velocity of combustion is decreased and the flame may be extinguished. With an alternating field the effect is the smaller the greater is the frequency (ν) and vanishes at 1.5×10^7 . At $\nu > 1.5 \times 10^7$ the alternating field accelerates combustion. Results are discussed in terms of an electron plasma in the gas, and the characteristic frequency of the plasma is calc. to be 7.2×10^7 for hydrocarbons, in agreement with the 20% acceleration observed with $\nu = 3.4 \times 10^7$. R. S. B.

Reduction of oxides of iron by hydrogen and carbon monoxide in a high-frequency electromagnetic field.—See B., 1937, 43.

Decomposition of hydrogen iodide and formation of hydrogen bromide under influence of X-rays. P. GÜNTHER and H. LEICHTER (Z. physikal. Chem., 1936, B, 34, 443—460).—In the decomp. of gaseous HI by exposure to X-rays the yield is independent of the pressure. The yield per ion calc. from the work of ionisation of HI by the X-rays, assuming that the reaction is initiated by ions created by the rays, agrees with the observed val. for the decomp. of HI by α -particles. To decompose 1 g.-mol. of HI 93 kg.-cal. ($\pm 10\%$) of secondary electron energy is needed. In the formation of HBr from H_2 and Br_2 vapour the yield is than in the HI decomp. and varies with the Br_2 pressure. It is inferred that the chemical action of X-rays in gaseous systems consists in some of the energy of the radiation appearing in the system as kinetic energy of secondary electrons, part of which then produces ion pairs, which excite the reacting mols. R. C.

Theory of photographic developability.—See B., 1937, 90.

Free radicals in the dissociation of gaseous metal alkyls by light. N. A. PRILESHAEVA and A. N. TEREIN (J. Phys. Chem. Russ., 1936, 8, 111—116).—Paneth's method of detecting free radicals is further developed by using a light beam and a photo-cell to measure the velocity of dissolution of the mirror. It is applied to detect radicals formed by photo-decomp. of $COMe_3$, $HgMe_2$, and $PbEt_4$. The max. production of radicals from $HgMe_2$ occurs at 2200 Å., where diffuse predissociation bands were described previously. $HgMe_2$ gives about 5 times as many radicals as $PbEt_4$. E. R.

Quantitative analysis of the photochemical bleaching of visual purple solutions in monochromatic light. H. J. A. DURTALL, C. F. GOODEVE, and R. J. LYTGOE (Proc. Roy. Soc., 1936, A, 156, 158—170).—See A., 1936, 1480. The quantum efficiency, defined as the quotient of the no. of chromophoric groupings destroyed by the no. of quanta absorbed, is approx. 1.

Blackening of photographic plates under the influence of positive ions. L. M. NEMENOV (Physikal. Z. Sovietunion, 1936, 9, 132—139).—The effect of positive ions from 7Li , of energy 1000—5000 volts, is nearly the same for Ilford Q and Hilger Schumann plates. The smallest current at 5000 volts registered on the plates after 5 min. exposure is 2.1×10^{-12} and 1.8×10^{-12} amp. persq. cm. respectively. R. S. B.

Absorption of carbon dioxide by amines. [Purification of hydrogen.]—See B., 1937, 35.

Interchange of hydrogen isotopes in complex cobaltammines. F. W. JAMES, J. S. ANDERSON, and H. V. A. BRISCOE (Nature, 1937, 139, 109).—In agreement with Erlenmeyer and Gärtner (A., 1934, 1321) it is found that all the amine H in complex Co amines can be interchanged with D when the amines are dissolved in approx. 3% heavy H_2O . At 25° and 35° interchange is slow, the time of half-

change being several hr. This may explain Bankowski's failure to obtain complete replacement of H in certain complex amines (A., 1935, 458, 1332).

L. S. T.

Preparation of conductivity water of high purity. P. A. THIESSEN and K. HERRMANN (Z. Elektrochem., 1937, 43, 66—69).—Apparatus and technique are described. E. S. H.

Acid fluorides of the alkali metals. I. Rubidium. E. B. R. PRIDEAUX and K. R. WEBB (J.C.S., 1937, 1—4).— $KF, 2HF, RbF, HF$, m.p. 204—205°, and $RbF, 2HF$, m.p. 51.7°, were prepared by evaporating aq. solutions containing HF. A substance, probably $RbF, 3HF$, m.p. $>0^\circ$, was obtained by adding RbF, HF to cold anhyd. HF. J. G. A. G.

Differential production of soluble sulphates from mixtures of metallic oxides.—See B., 1937, 34.

[Thermal stability of] silver oxides used in the production of caesium photoelectric cells.—See B., 1937, 54.

Action of cupric sulphate and nitrate on pure copper. G. GENESLAY (Bull. Soc. chim., 1937, [v], 4, 111—114).—In a limited supply of O_2 the product is Cu_2O ; in excess of O_2 the formation of Cu_2O is followed by that of $3CuO, SO_3, 2H_2O$ or $Cu(NO_3)_2, 3Cu(OH)_2$. In CO_2 , $CuSO_4$ and Cu do not form a basic carbonate. E. S. H.

Corrosion of copper by magnesium chloride solutions in moist air and in an atmosphere of carbon dioxide. G. GENESLAY (Bull. Soc. chim., 1937, [v], 4, 117—120).—Aq. $MgCl_2$ in presence of air yields $CuCl_2, 3CuO, 3H_2O$; in presence of CO_2 the product is malachite. E. S. H.

Corrosive action of alkali carbonates and of ammonium carbonate on copper. G. GENESLAY (Bull. Soc. chim., 1937, [v], 4, 120—122).—The product is generally malachite, although in some circumstances azurite may be formed. E. S. H.

Can moulds modify the action of copper sulphate on copper? G. GENESLAY (Bull. Soc. chim., 1937, [v], 4, 123—125).—The action is not modified by the presence of *Penicillium glaucum* (cf. Compt. rend., 1890, 111, 655). E. S. H.

Identification, by Debye and Scherrer's method, of constituents of the corrosion patinas of copper. M. GUILLOT and G. GENESLAY (Bull. Soc. chim., 1937, [v], 4, 125—129).—When Cu is exposed to aq. $CuSO_4$ in presence of air the film of corrosion product consists of $3CuO, SO_3, 2H_2O$; in aq. $Cu(NH_3)_4SO_4$ in presence of CO_2 the product is malachite, but when access of air is prevented Cu_2O is formed. Alkali H carbonate solutions give a blue patina consisting of azurite; chloride solutions yield atacamite, $CuCl_2, 3CuO, 3H_2O$. E. S. H.

Copper carboxydiammine [diamminocarbonato-copper] and its decomposition products with water and with heating. G. GENESLAY (Bull. Soc. chim., 1937, [v], 4, 114—116).—The prep. of $Cu(NH_3)_2CO_3$ by a modified procedure is described. It is sol. as a non-electrolyte in EtOH or $COMe_2$, and is hydrolysed by H_2O yielding malachite. Dry

thermal decomp. yields a mixture of N compounds and basic Cu carbonates. E. S. H.

Oxidation of magnesium in the liquid state. R. DELAVAUULT (Separate, Paris Univ., 1936, 94 pp.; cf. A., 1934, 853, 1185).—The oxidation of molten Mg in air begins by formation of globular protruberances, probably due to surface phenomena, e.g., difference in surface tension. Pure Mg does not show this effect when heated in pure O₂ at low pressure, or in N₂, NH₃, CO, or H₂O vapour at atm. pressure, but shows it in CO₂. Addition of 0.5% of Mg to Zn or 25% of Mg to Al produces the phenomenon with these metals. The same effect is shown by Al heated in a mixture of O₂ and Br. S, SO₂, NH₄BF₄, NH₄F, NH₄HF₂, HF, BF₃, Se, NH₄Cl, and HCl all prevent ignition of molten Mg in air. The results are in accord with Pilling and Bedworth's theory (B., 1923, 359). J. W. S.

So-called magnesium trisilicate.—See B., 1937, 85.

Formation of atacamite by incorporation of copper powder in magnesium oxychloride compositions. D. S. HUBBELL (J. Amer. Chem. Soc., 1937, 59, 215—216).—X-Ray examination has identified atacamite as the product of exposing the compositions to moist air. Sunlight retards and ultra-violet light prevents its formation. E. S. H.

Effect of low-*p_H* waters on zeolites.—See B., 1937, 1.

Reactions of various salts in preventing scale in steam boilers.—See B., 1937, 1.

Formation of mercuriammonium compounds from mercuriammonium nitrate by double decomposition. III. Mercuriammonium bromate. S. AUGUSTI (Boll. Chim.-farm., 1936, 75, 661—664; cf. A., 1936, 574).—A yellowish-white ppt. of Hg₂NBrO₃·H₂O is obtained by mixing aq. solutions of KBrO₃ (2.5%) and ammoniacal Hg₂NNO₃. The following reactions occur quantitatively: (1) Hg₂NBrO₃ + 2Na₂S + 3H₂O → 2HgS + NH₃ + 3NaOH + NaBrO₃, (2) Hg₂NBrO₃ + 8KI + 4H₂O → 2K₂[HgI₄] + NH₄BrO₃ + 4KOH, (3) Hg₂NBrO₃ + 4Na₂S₂O₃ + 4H₂O → 2Na₂[Hg(S₂O₃)₂] + 4NaOH + NH₄BrO₃. On warming reactions (2) and (3) are accompanied by: NH₄BrO₃ + NaOH → NaBrO₃ + NH₃ + H₂O (similarly with KOH). O. J. W.

Stability of [sodium] perborate in washing powders.—See B., 1937, 132.

Reaction of alumina with iron sulphide in presence of carbon.—See B., 1937, 43.

Higher-valency compounds of the rare earths. II. Dysprosium oxide. G. JANTSCH and E. WIESENBERGER (Monatsh., 1936, 68, 394—398).—Pure Dy₂O₃ shows no appreciable gain in wt. when heated in O₂ or air at 300—1000°, whilst Dy₂O₃ containing a little Tb₂O₃ shows only a slight gain. The product obtained by fusion of Dy₂O₃ in KNO₃ and NaNO₃ and in KClO₃, after removal of sol. matter, contains no higher oxide which liberates I from KI. J. W. S.

[Explosive] compounds of thallium with aromatic nitro-compounds.—See B., 1937, 190.

Katz effect. I. TANANAEV (J. Gen. Chem. Russ., 1936, 6, 1430—1432).—When aq. HF and H₂SiF₆ are titrated together the vol. of KOH used is < when the acids are titrated separately; the effect is due to adsorption of HF by SiO₂ present as impurity, and not, as Katz supposed (cf. A., 1904, ii, 442), to formation of double compounds of HF and K₂SiF₆. R. T.

Reaction of titanium tetrachloride with hydrogen peroxide in dry ethyl acetate. D. G. NICHOLSON and M. A. REITER (J. Amer. Chem. Soc., 1937, 59, 151—152).—A white compound, containing Ti, Cl, and H₂O₂ in the ratio 1 : 1 : 1, has been prepared. The compound is sol., with decomp., in H₂O, and decomposes when heated. E. S. H.

Decomposition of zircon by chlorination. G. P. ALEXANDROV (Ukrain. Chem. J., 1936, 11, 287—297).—A mixture of zircon (62% ZrO₂) and wood charcoal, when heated in a current of Cl₂ at 750—800°, gives in an exothermic reaction >90% of ZrCl₄, which is separated by pptn. as ZrOCl₂·8H₂O from the distillate containing also FeCl₃, AlCl₃, and TiCl₄. J. J. B.

Preparation of hafnium salts. G. P. ALEXANDROV, G. O. BYK, and J. P. HOCHSCHTEIN (Ukrain. Chem. J., 1936, 11, 298—303).—The separation method of Prandtl (A., 1933, 38) may be applied to the crude ZrOCl, mentioned (cf. preceding abstract). J. J. B.

Existence and stability of the phosphonitrile radicle PN: synthesis of phosphorus dichloronitrile. H. MOUREU and G. WETROFF (Compt. rend., 1937, 204, 51—53).—(PNCl₂)₃ is formed from (PN)_n (A., 1935, 742; 1936, 440) and Cl₂ at 500—800°. The mechanism of the reaction is discussed. A. J. E. W.

Preparation and properties of certain lower phosphoric acids. III. Magnesium hypophosphate. V. N. OSIPOV and A. S. TIROVA (J. Gen. Chem. Russ., 1936, 6, 1559—1562).—The hydrates Mg₂P₂O₆·2, 3, 6, and 12H₂O are described; the existence of Mg₂P₂O₆·24H₂O (Rammelsberg, A., 1892, 404) is questioned. R. T.

Ammonolysis of tantalum pentachloride. H. MOUREU and C. H. HAMBLET (J. Amer. Chem. Soc., 1937, 59, 33—40).—Equilibrium pressure-composition determinations show that the primary reaction product of liquid NH₃ with TaCl₅ is Ta(NH₂)₂Cl₃·7NH₃, which is decomposed to Ta(NH₂)₂Cl₃ by heating in vac., via Ta(NH₂)₂Cl₃·5NH₃. Thermal decomp. of Ta(NH₂)₂Cl₃ in presence of gaseous NH₃ yields Ta₃N₅ and in vac. some TaN and an undetermined, volatile Ta compound are also formed. At higher temp., in NH₃ or vac., Ta₃N₅ decomposes into TaN and N₂. Ta₃N₅ has *d* 8.5 and is slightly diamagnetic. The magnetic susceptibility of TaCl₅ is $-0.231 \pm 0.002 \times 10^{-6}$. E. S. H.

Mixed halides of bismuth. G. P. LUTSCHINSKI and A. I. LICHATSHEVA (J. Gen. Chem. Russ., 1936, 6, 1452—1455).—BiCl₂ and Br at 70—90° give BiCl₂Br. BiOI and aq. HCl yield BiCl₂I, converted by hydrolysis into BiCl₂·OH. R. T.

Thiocyanogen chlorides. A. BARONI (Atti R. Accad. Lincei, 1936, [vi], 23, 871—873).—By the action of Cl_2 on a solution of $(\text{CNS})_2$ in CHCl_3 at -60° a white solid, m.p. $\sim 70^\circ$, with the composition CNSCl , is obtained. It is probably a mixture of the monochloride with higher polymerides (cf. A., 1927, 46). The trichloride $(\text{CNS})\text{Cl}_3$, orange, b.p. $57-58^\circ/20$ mm., d_4^{20} 1.6208, 1.576, was obtained by the action of Cl_2 in excess on a solution of $(\text{CNS})_2$ in EtBr at -50° . O. J. W.

Selenium iodides. E. MONTIGNIE (Bull. Soc. chim., 1937, [v], 4, 132—135).—The m.p. diagram of the Se—I system has been redetermined. The results show that the supposed compounds of Se and I do not exist. Chemical evidence supporting this conclusion is described. E. S. H.

Preparation and hydration of $\text{CaO}, \text{Cr}_2\text{O}_3$ and $2\text{CaO}, \text{Cr}_2\text{O}_3$. Y. SANADA (J. Soc. Chem. Ind. Japan, 1936, 39, 466B).—On fusing 1 mol. of CaCO_3 with 1 mol. of Cr_2O_3 at $1200-1350^\circ$ for 3 hr., $\text{CaO}, \text{Cr}_2\text{O}_3$ was obtained in orthorhombic crystals which do not react with H_2O . From 2 mols. of CaO and 1 mol. of Cr_2O_3 were obtained irregular grains of $2\text{CaO}, \text{Cr}_2\text{O}_3$, from which H_2O dissolved $\text{Ca}(\text{OH})_2$. G. H. C.

Theory of chrome tanning.—See B., 1937, 68.

Production of bromides by action of bromine on bases in presence of formates.—See B., 1937, 33.

Compounds of nitroprussides and hexamethylenetetramine.—See A., II, 89.

Oxidation of univalent nickel by the action of water in presence of CN' ions. G. TEDESCHI (Atti R. Accad. Lincei, 1936, [vi], 23, 894—899).—Oxidation-reduction potentials of the system $\text{Pt}[\text{Ni}'-\text{Ni}''|\text{KCl}|\text{Hg}_2\text{Cl}_2|\text{Hg}]$ have been measured, in which the Ni ions result from the dissociations $[\text{Ni}(\text{CN})_3]''$, $\text{Ni}' + 3\text{CN}'$ and $[\text{Ni}(\text{CN})_4]''' \rightleftharpoons \text{Ni}'' + 4\text{CN}'$. Measurements were made without and with excess of CN' ions. Only the solutions of $\text{K}_2[\text{Ni}(\text{CN})_3]$ containing excess of CN' reduce H_2O according to $\text{Ni}'' + \text{H}_2\text{O} = \text{Ni}' + \frac{1}{2}\text{H}_2 + \text{OH}'$. This process, however, is not catalysed by the CN' ions (cf. A., 1923, i, 904). O. J. W.

Aquotisation and hydrolysis of [cobalt] chloro- and aquo-pentammine chlorides. P. SPACU (Bull. Soc. chim., 1937, [v], 4, 130—132).—X-Ray investigations have shown that $[\text{CoCl}(\text{NH}_3)_5]\text{Cl}_2$ (I) is converted in H_2O or dil. HCl into $[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}]\text{Cl}_3$, which is in turn converted by aq. NH_3 into $[\text{Co}(\text{NH}_3)_5\text{OH}]\text{Cl}_2$ (II). By heating with HCl (II) is reconverted into (I). E. S. H.

Pyridine complexes of quadrivalent platinum derivatives.—See A., II, 74.

Potentiometric titration. E. H. T. JUKES (J. Inst. Brew., 1937, 43, 80—81).—A convenient potentiometric technique, using a quinhydrone electrode, is described. J. S. A.

Chemical spectral analysis.—See B., 1937, 51.

Quantitative precipitation at extreme concentrations. V. V. NJEGOVAN and V. MARJANOVIĆ

(Z. anal. Chem., 1937, 108, 33—34).—Polemical, against Kolthoff (A., 1936, 677). J. S. A.

Azo-coupling in volumetric analysis. A. KOROLEV and K. ROSTOVZEVA (Z. anal. Chem., 1937, 108, 26—29).—The Bucherer diazonium salt titration is modified by adding gum arabic or gelatin as a protective colloid, to prevent coagulation of the azo-dye and adsorption of the azo-component. The end-point is detected by spotting on filter-paper impregnated with NH_4Cl . Oxidisable substances may be titrated in presence of S or, better, $\text{Na}_2\text{S}_2\text{O}_3$. J. S. A.

Buffer solutions for determination of p_H . A. SHORE (Biochem. J., 1937, 31, 219—222).—Stock solutions of p_H at the limits of the range required are prepared. Solutions of intermediate p_H are obtained by mixing the stock solutions according to tabulated data. J. N. A.

[Determination of] p_H of electroplating baths.—See B., 1937, 51.

Systematic detection and separation of anions. Z. KARAOGLANOV (Z. anal. Chem., 1936, 107, 395—408).—A group test procedure is described whereby the common anions are separated progressively into (i) acids giving volatile products when heated with AcOH : CO_3'' , CN' , S'' , SO_3'' , $\text{S}_2\text{O}_3''$, NO_2' , OCl' ; (ii) NO_3' and BO_3''' , tested for immediately following removal of group (i); (iii) acids pptd. from AcOH solutions by $\text{Ba}(\text{OAc})_2 + \text{Ca}(\text{OAc})_2$: SO_4'' , SiF_6'' , IO_3' , F' , $\text{C}_2\text{O}_4''$, CrO_4'' , tartrate; (iv) acids pptd. from the filtrate on making alkaline with NH_3 : PO_4''' , AsO_4''' , SiO_3'' ; (v) acids pptd. by $\text{Pb}(\text{OAc})_2$ in neutral solution: $\text{Fe}(\text{CN})_6'''$, I' , tartrate, AsO_3''' , Br' , Cl' , CNS' ; (vi) $\text{Fe}(\text{CN})_6'''$ and AsO_3''' , pptd. completely on making the filtrate from (v) alkaline; (vii) CNS' , Br' , Cl' , I' , pptd. by AgNO_3 from HNO_3 solution; (viii) ClO_3' , ClO_4' , BrO_3' , remaining unpptd. The subsequent detection and separation of acids within each group is described. J. S. A.

Semi-micro- and micro-Carius determination. R. H. KIMBALL, H. H. WITTENBURG, and D. E. MACFADYEN (Ind. Eng. Chem. [Anal.], 1937, 9, 48—49).—Modified procedure is described. The sample is weighed in a Ag-foil capsule, which dissolves and allows the halide to be siphoned directly from the bomb tube on to a micro-filter tube. E. S. H.

Behaviour of perchloric acid in analytical work. J. MEYER and W. SPORMANN (Z. anal. Chem., 1936, 107, 387—388).—Explosions are not due to the formation of the readily hydrolysed perchloric esters (cf. this vol., 46), but to the spontaneous decomp. of HClO_4 in presence of org. matter. J. S. A.

Danger of explosion with perchloric acid. O. HACKL (Z. anal. Chem., 1936, 107, 385—387).—The risk of explosion (cf. above) has been already described in the literature. J. S. A.

Sodium chlorite as a volumetric oxidising agent. D. T. JACKSON and J. L. PARSONS (Ind. Eng. Chem. [Anal.], 1937, 9, 14—15).—Advantages of standard solutions of NaClO_2 are discussed. Results for the determination of SO_2 , SO_3'' , and HSO_3' by NaClO_2 are given. E. S. H.

Determination of iodine in water.—See B., 1937, 93, 193.

Determination of iodine in tincture of iodine and in sodium and potassium iodides.—See B., 1937, 186.

Use of iodine and potassium iodate as volumetric oxidising agents in solutions containing mercuric salts. I. Effect of mercuric salts on the stoichiometry of oxidation-reduction reactions. Titration of arsenite and antimonite with standard solutions of iodine or potassium iodate. N. H. FURMAN and C. O. MILLER. II. Oxidation of phenylhydrazine and of semicarbazide by means of potassium iodate. C. O. MILLER and N. H. FURMAN (J. Amer. Chem. Soc., 1937, 59, 152—161, 161—164).—I. The influence of Hg^{++} on the oxidation of halides by various agents has been investigated. The oxidation-reduction potentials of equiv. mixtures of AsO_4^{+++} and AsO_3^{+++} and of I and I' have been determined in aq. HCl and H_2SO_4 at different concns.; the influence of Hg salts on the potentials of the I-I' mixtures has been explained. 1.2—3.8*N*-arsenite or 2—2.8*N*-antimonite solutions in HCl can be titrated with standard I if HgCl_2 is added to increase the I-I' potential. Procedure for the determination of Sb with standard KIO_3 by reduction to I, I' , or ICl , as desired, is described.

II. The best conditions for the quant. reduction of KIO_3 to KI, with Hg present, or to ICl in 3—6*N*-HCl by $\text{NHPh}\cdot\text{NH}_2$ (I) or $\text{NH}_2\cdot\text{CO}\cdot\text{NH}\cdot\text{NH}_2$ (II) have been investigated. With (I) an end-point may be obtained, corresponding with reduction of KIO_3 to I, at low acid concn. (II) may be titrated selectively by KIO_3 when $\text{CO}(\text{NH}_2)_2$ is also present. The mechanisms of the reactions involved have been investigated.

E. S. H.

Determination of fluorine in water.—See B., 1937, 193.

Iodometric determination of sulphate in natural waters. N. GUSEV (Hydrochem. Mat., U.R.S.S., 1936, 9, 3—16).—200 c.c. of the H_2O are heated to the b.p. and 5 c.c. of a solution of BaCrO_4 in HCl are added. After heating for 3—5 min. the liquid is neutralised with 2.5*N* aq. NH_3 , filtered, and the CrO_4^{--} in the filtrate determined iodometrically. The average error is 2%.

R. S. B.

Indirect titration of sulphate with barium chloride, using sodium rhodizonate (or the sodium salt of tetrahydroxybenzoquinone) as indicator in the solution. A. MUTSCHIN and R. POLLAK (Z. anal. Chem., 1937, 108, 8—18).—Only the bluish-red Ba rhodizonate pptd. in presence of halogens reacts with SO_4^{--} sufficiently rapidly to show an indicator action. SO_4^{--} cannot be titrated directly with Ba, but may be pptd. with an excess of BaCl_2 in presence of much NH_4Cl + 30% of COMe_2 . Na rhodizonate is added, and the excess of Ba is titrated back very slowly with $(\text{NH}_4)_2\text{SO}_4$.

J. S. A.

[Simultaneous] determination of sulphur dioxide and sulphur trioxide from burning sulphur.—See B., 1937, 34.

Determination of sulphur in oils etc.—See B., 1937, 11.

Rapid determination of selenium in sulphur.—See B., 1937, 34.

Determination of nitrogen in nitrates and nitric esters in the Lunge nitrometer and by Schlosing's method. I—III. K. LESNICHENKO (Chem. Obzor, 1935, 10, 140—146, 165—168, 192—193; Chem. Zentr., 1936, i, 2150).

J. S. A.

Determination of ammonia in sea-water. V. S. KRASNOVA (J. Appl. Chem. Russ., 1936, 9, 2068).—Thomas' method (A., 1912, ii, 991) is recommended.

R. T.

Influence of electrolytes on the reduction of nitrates with Cu-Mg (alloy) and Cu-Zn powder. T. ARND and H. SEGEBERG (Angew. Chem., 1937, 50, 105—107; cf. B., 1932, 201; 1933, 118; A., 1936, 442).—0.5 g. of NaNO_3 is quantitatively reduced to NH_4^+ by 5 g. of Cu-Mg alloy in the presence of CaCl_2 , BaCl_2 , NaCl, or KCl; with NaCl no foaming occurs. With Cu-Zn dust the efficiency of the reduction of 0.5 g. of NaNO_3 is greater in the absence of MgO and is reduced by chlorides in the order $\text{MgCl}_2 < \text{CaCl}_2 < \text{BaCl}_2 < \text{NaCl} < \text{KCl}$, reaching 100% with 15 g. of dust and 10 g. of MgCl_2 or 20 g. of $\text{CaCl}_2\cdot 6\text{H}_2\text{O}$; using 0.25 g. of NaNO_3 , however, low results were obtained only with CaCl_2 in the absence, and MgCl_2 in the presence, of MgO. Quant. reductions of fertiliser salts with Cu-Zn dust in the presence of NaCl are recorded. Zn dust, in presence of NaCl, effected complete reduction of NaNO_3 only in fairly acid (HCl) solutions.

R. C. M.

Micro-analysis of gases. IV. Nitrous oxide and methane. F. E. BLACET and D. H. VOLMAN (Ind. Eng. Chem. [Anal.], 1937, 9, 44—45; cf. A., 1933, 930; 1934, 1188).—Modified procedure for the combustion of gases, using a heated Pt loop, is described. N_2O is determined by removing O_2 and H_2O by P and KOH, respectively, and then reducing with H_2 . CH_4 is determined by combustion with excess of O_2 , removing H_2O , and determining the CO_2 produced.

E. S. H.

Detection of nitrous and nitric acids in drinking waters.—See B., 1937, 93.

Photoelectric determination of phosphorus. C. W. EDDY and F. DE EDS (Ind. Eng. Chem. [Anal.], 1937, 9, 12—14).—A photoelectric colorimeter and its application to the determination of P (0.001—0.01 mg.) in biological matter by Kuttner and Liechtenstein's procedure (A., 1930, 725) are described.

E. S. H.

Determination of carbon in glasses coloured by carbonaceous matter.—See B., 1937, 138.

Determination of atmospheric carbon dioxide.—See B., 1937, 133.

Rapid determination of carbon dioxide in air.—See B., 1937, 191.

Determination of alkali in glass.—See B., 1937, 138.

Use of picric acid in qualitative microchemical analysis. A. F. ORLENKO and N. G. FESSENKO (Z. anal. Chem., 1936, 107, 411—417).— NH_4^+ , Na, Mg, Ba, Sr, Pb, Zn, Ni, Hg^{++} , Hg^+ , and Ag⁺ give

with picric acid cryst. salts of highly characteristic form. J. S. A.

Colorimetric determination of silver as colloidal sulphide. L. DE BROUCKERE and R. PETIT (Bull. Soc. chim. Belg., 1936, 45, 717—725).—The method described for the determination of Cu (cf. A., 1935, 318) is applied to the determination of Ag in HNO_3 solutions. For the greatest accuracy, $[\text{Ag}]$ should be between 0.0056 and 0.056 g. per litre, and $[\text{HNO}_3]$ should be between 0.03 and 0.13*N*.

C. R. H.

Determination of hardness of waters.—See B., 1937, 92, 192.

Determination of beryllium, aluminium, and magnesium in ferrous alloys.—See B., 1937, 47.

Specificity of the magnesium hypiodite reaction. V. LUCAS (Rev. Assoc. Brasil. Farm., 1936, 17, 9—16).—The Schlagdenhauffen NaOBr-KI reaction for Mg depends on a simple adsorption of I by the pptd. Mg(OH)_2 . Greater sensitivity is obtained by the substitution of slightly alkaline NaOCl for the NaOBr . The ppt. given by Al may be distinguished by addition of excess of NaOH , which dissolves the Al(OH)_3 . A ppt. is obtained with <0.001 mg. of Mg per litre, and a colorimetric method for smaller quantities is described. L. A. O'N.

Colour test for magnesium. E. EEGRIWE (Z. anal. Chem., 1937, 108, 34—37).—To dil. aq. benzoazurin G, the neutral test solution, free from NH_4 salts, is added, + a few drops of conc. aq. NH_3 . In presence of Mg, a blue coloration or bluish-violet ppt. is produced; limiting concn. 1 in 900,000. Cations other than K, Na, Rb, Cs, Li, and Tl should be absent. J. S. A.

Determination of magnesium in natural water by Pfeifer's method. N. GUSEV (Hydrochem. Mat., U.S.S.R., 1936, 9, 17—24).—100 c.c. of the H_2O are freed from CO_2 by neutralising with 0.05*N*-HCl (alizarin indicator). The solution is diluted to 200 c.c. with excess of aq. Ca(OH)_2 and kept for 1—2 hr. on a water-bath. The liquid is siphoned from the Mg(OH)_2 and titrated with 0.05*N*-HCl. R. S. B.

Phosphate method of determination of magnesium. P. S. SAVTSCHENKO (J. Appl. Chem. Russ., 1936, 9, 2069—2074).— $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$ is best pptd. from aq. EtOH solutions. Theoretical results are obtained for <5 mg. of Mg. Excess of NH_4^+ does not interfere. R. T.

Use of crotonaldehyde to reduce the post-precipitation of zinc on copper sulphide. J. R. CALDWELL and H. V. MOYER (J. Amer. Chem. Soc., 1937, 59, 90—92).—Small concns. of crotonaldehyde (I) minimise the co-pptn. of ZnS with CuS . (I) appears to react with H_2S adsorbed at the CuS surface and thus prevents post-pptn. of ZnS . E. S. H.

Quantitative spectral analysis of zinc.—See B., 1937, 144.

Determination of zinc in foods.—See B., 1937, 82.

Determination of cadmium in zinc concentrates and metallic zinc. Method of inner M (A., I.)

electrolysis using simple apparatus.—See B., 1937, 49.

Hexanitrat ammonium cerate as a proposed reference standard in oxidimetry. G. F. SMITH, V. R. SULLIVAN, and G. FRANK (Ind. Eng. Chem. [Anal.], 1936, 8, 449—451).—The prep. of pure $(\text{NH}_4)_2\text{Ce(NO}_3)_6$ from a low-grade, Th-free mixture, containing 40—50% of CeO_2 and Ce_2O_3 and 50—60% of Pr, Nd, and La oxides, is described. $(\text{NH}_4)_2\text{Ce(NO}_3)_6$ is a complex salt and is stable in 0.5—2.0*N*- H_2SO_4 at 100°. E. S. H.

Potentiometric determination of rare earths. G. JANTSCH and H. GAWALOWSKI (Z. anal. Chem., 1936, 107, 389—395).—The Ce earths may be determined by pptn. from neutral or weakly acid solution with an excess of 0.1*N*- $\text{H}_2\text{C}_2\text{O}_4$, and subsequently titrating the excess of $\text{H}_2\text{C}_2\text{O}_4$ or an H_2SO_4 solution of the ppt., potentiometrically with KMnO_4 . Alternatively, the neutral aq. nitrates may be titrated directly with 0.1*N*- $\text{Na}_2\text{C}_2\text{O}_4$, a small amount of standard $\text{Hg}_2(\text{NO}_3)_2$ being added to permit the use of a Hg reference electrode. The method is accurate also for Y, but not for the Yb metals. J. S. A.

Determination of small amounts of aluminium in presence of aluminium oxide. I. J. KLINOV and T. I. ARNOLD (J. Appl. Chem. Russ., 1936, 9, 2075—2078).—The Al_2O_3 , containing 2—10% of Al, is treated with standard FeCl_3 , and the FeCl_2 formed is determined titrimetrically. Gravimetric methods, based on oxidation of Al to Al_2O_3 , extraction of Al by dil. HCl, or pptn. of Cu from aq. CuSO_4 by Al, gave high results. R. T.

Determination of alumina by means of 8-hydroxyquinoline. P. P. BUDNIKOV and S. S. SHUKOVSKAJA (J. Appl. Chem. Russ., 1936, 9, 2079—2087).—Methods for determination of Al in bauxite, clay, and earthenware are discussed. R. T.

8-Hydroxyquinoline method for rapid determination of alumina. W. STEGER (Ber. deut. keram. Ges., 1935, 16, 624—627; Chem. Zentr., 1936, i, 2180).—The method is satisfactory. J. S. A.

Rapid determination of aluminium in complex irons and steels.—See B., 1937, 47.

Separation of gallium and its colorimetric determination by means of quinalizarin. H. H. WILLARD and H. C. FOGG (J. Amer. Chem. Soc., 1937, 59, 40—45).—Ga may be determined colorimetrically (0.02 mg. per litre) by the pink or amethyst lake formed with quinalizarin under specified conditions. V and Mo must be absent, and only small amounts of Al or Fe should be present. Procedure for separating Ga from larger amounts of Pb, Cu, Sn, Sb, In, Pt, and Ge, which also give coloured lakes under the prescribed conditions, is described. E. S. H.

Determination of manganese in manganese and iron citrate.—See B., 1937, 86.

[Analytical] deposition of manganese [in steel] at the mercury cathode.—See B., 1937, 52.

Simultaneous photometric determination of manganese, silicon, and chromium. H. PINSL (Arch. Eisenhüttenw., 1936—1937, 10, 139—143).

The method depends on the measurement of the extinction coeff. in the Pulfrich photometer with appropriate filters of the colours produced by oxidising a solution of the steel in HNO_3 with $(\text{NH}_4)_2\text{S}_2\text{O}_8$ in the presence of AgNO_3 and treating the solution with $(\text{NH}_4)_2\text{MoO}_4$. Various corrections are necessary and these are determined on solutions free from Mn, Cr, and Si. The results are calc. to % by means of graphs constructed from standard solutions.

A. R. P.

Determination of titre of permanganate solutions by means of ammonium oxalate. M. M. KIRILOV (J. Appl. Chem. Russ., 1936, 9, 2065—2067).— $(\text{NH}_4)_2\text{C}_2\text{O}_4$ pptd. from aq. solution by EtOH and dried at $85\text{--}90^\circ$ is recommended for standardisation of aq. KMnO_4 .

R. T.

Detection and separation of rhenium. I. WADA and R. ISHII (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 55—84).—The sample is treated with HNO_3 and HF if necessary, evaporated to dryness, heated at $120\text{--}130^\circ$ for 1 hr., and dissolved in 6*N*- HNO_3 , when Ge, W, Nb, and Ti are insol. The solution is evaporated almost to dryness and boiled with conc. $\text{HBr} + \text{Br}$, when As, Ge, and Se are distilled off. On dilution Ag is pptd. as AgBr , and Tl, Au, In, and Ga may be extracted from the filtrate with Et_2O . HCl is added to the remaining HBr solution until 0.3*N* in HCl and the cold product is treated with H_2S , when most of the Re remains in solution. The ppt. is dissolved in cold 0.3*N*- HNO_3 , when most of the Re goes into solution. The Re in solution is pptd. as sulphide with Mo, Pt, Ir, Rh, and Ru. The Re in the ppt. is dissolved in hot 2*N*- HNO_3 and recovered as sulphide after removal of Pb by H_2SO_4 , Bi by hydrolysis, Pt and Pd by HCO_2H , Te by H_2SO_3 , Cu and Cd by NaOH , and Sb by Na_2O_2 . All the Re thus obtained as sulphide is dissolved in aqua regia, and Ru is removed as RuO_4 by adding NaOH , heating, and passing in Cl_2 . The Re is again obtained as sulphide and this is dissolved in HCl and distilled with H_2SO_4 at $190\text{--}195^\circ$. Re is collected in the receiver and can be detected by SnCl_2 and KCNS . The determination consists in converting the sulphide into per-rhenate by H_2O_2 , and weighing as the nitron salt. R. S. B.

Detection of ferrous iron in presence of ferrocyanide. A. B. SCHACHKELDIAN (J. Appl. Chem. Russ., 1936, 9, 2097).—2—3 ml. of 5% $\text{K}_4\text{Fe}(\text{CN})_6$ are added to 4 ml. of 3% MnSO_4 containing 0.25% of CoSO_4 , when a white ppt. is obtained in absence, and a greenish-blue ppt. in presence, of traces of Fe^{II} .

R. T.

Determination of small quantities of iron oxide in raw materials and glass.—See B., 1937, 133, 136, 138.

Determination of official preparation of iron by means of ceric sulphate. I. Assay of saccharated iron carbonate.—See B., 1937, 85.

Assay of saccharated iron compounds.—See B., 1937, 86.

Colorimetric determination of cobalt by nitroso-*R*-salt. J. W. H. LUGG and S. W. JOSLAND (Austral. J. Exp. Biol., 1936, 14, 319—321).—The determination of Co by nitroso-*R*-salt (A., 1933, 312)

fails in the presence of excess of Ca. A modification of the method is described in which hydroxides and phosphates of other metals present are kept in solution by the addition of citrate, and buffered NaOH is used to bring the p_H to 8.5. The solution is not heated after addition of HNO_3 .

E. A. H. R.

Electro-analysis of cobalt with three electrodes. F. GUZMAN and M. RIAL (Anal. Fis. Quím., 1936, 34, 636—640; cf. A., 1936, 1222).—The indicator potential method gives results for $\text{NH}_3\text{--Co}$ solutions containing $\text{SO}_4^{''}$, $\text{HCO}_2^{'}$, $\text{PO}_4^{'''}$, $\text{OAc}^{'}$, $\text{C}_2\text{O}_4^{''}$, and $\text{BO}_3^{'''}$ to within 1—2%. Anodes of passive Fe and cathodes of brass are used, with an indicator potential of about 700 mv., corresponding to 0.017 ma. It is not possible to separate Co from Ni.

L. A. O'N.

Determination of chromium and sulphur [in iron and steel].—See B., 1937, 142.

Electrometric analysis of mordanting baths for the textile industry.—See B., 1937, 30.

Fluorine derivatives of quadrivalent uranium, and the determination of uranium as fluoride. V. G. CHLOPIN and E. K. GERLING (J. Gen. Chem. Russ., 1936, 6, 1701—1714).—The U^{IV} salt is dissolved in aq. HF, and NH_4F is added, when U is quantitatively pptd. as $\text{UF}_4 \cdot \text{NH}_4\text{F} \cdot 0.5\text{H}_2\text{O}$; Fe^{III} and $>30\%$ of V do not interfere. The salts $\text{UF}_4 \cdot 0.5$, 1.5, and 2*H*₂O are described. The above compounds are regarded as co-ordination complexes. R. T.

Rapid spectral determination of tin in ores.—See B., 1937, 48.

Spectrographic analysis [and electrolytic refining] of tin.—See B., 1937, 48.

Colorimetric determination of titanium in presence of bromine compounds. D. LEWIS (Z. anal. Chem., 1936, 107, 408—409; cf. A., 1936, 813).—Errors in the determination of Ti by means of H_2O_2 , due to the liberation of Br, may be obviated by addition of COMe_2 .

J. S. A.

Inorganic chromatography. G. M. SCHWAB and K. JOCKERS (Naturwiss., 1937, 25, 44; cf. A., 1936, 810, 1218).—The methods of chromatographic analysis can be applied to the separation of cations. From neutral aq. solution, cations are adsorbed on Al_2O_3 in the following order: Sb^{III} , Bi^{III} , Cr^{III} , Fe^{III} , UO_2^{++} , Pb^{++} , Hg^{++} , Cu^{++} , Ag^{+} , Zn^{++} , Co^{++} , Cd^{++} , Ni^{++} , Mn^{++} . This order is unaffected by the combinations of ions present in a system, or by the anions present. In some parts of the series the separation is very narrow, e.g., $\text{Cr}^{III}\text{--Fe}^{III}$, $\text{Co}^{++}\text{--Cd}^{++}$, $\text{Cd}^{++}\text{--Ni}^{++}$, but Co^{++} is readily separable from Ni^{++} . The basic nature of the adsorbent also sometimes gives rise to difficulty. Separation of two ions which are close together in the series is often made more obvious by the addition of an element lying between them. H^{+} is adsorbed like a metal. The above adsorption series is entirely altered when the adsorption takes place from an aq. NH_3 or alkali tartrate solution. In aq. NH_3 the series is Co^{++} , Zn^{++} , Cd^{++} , Cu^{++} , Ni^{++} , Ag^{+} , and in alkali tartrate, (Mn^{++} , Cd^{++} , Zn^{++} , Co^{++} , Ni^{++}), Pb^{++} , Cu^{++} , Bi^{III} , Fe^{III} , Cr^{III} , the ions in parentheses being almost inseparable. The method is of use in the detection of traces of impurities.

A. J. M.

Chromatography of colourless substances. L. ZECHMEISTER, L. DE CHOLNOKY and (MLLE.) E. UJHELYI (Bull. Soc. Chim. biol., 1936, 18, 1885—1887).—The use is described of solutions of various reagents which are often suitable for rendering visible the positions of colourless layers of substances adsorbed in the chromatographic column. P. W. C.

Determination of bismuth as 8-nitroquinoline bismuthi-iodide. G. CANNERY and D. BIGALLI (Annali Chim. Appl., 1936, 26, 455—460).—Berg and Wurm's method (A., 1927, 847) is modified by the use of 8-nitroquinoline. The ppt. may be dried at 100° and weighed as $C_6H_5O_2N_2 \cdot HBiI_4$, or dissolved in acid and titrated with KIO_3 . Good results have also been obtained by titrating the I liberated from the HCl solution of the ppt. by HNO_2 , after extraction with CS_2 . The volumetric methods are more suitable for the determination of small quantities of Bi.

L. A. O'N.

[Electrolytic] determination of bismuth and copper in lead alloys containing antimony and tin.—See B., 1937, 146.

Drop reactions for detection of osmium. N. A. TANANAEV and A. N. ROMANJUK (Z. anal. Chem., 1937, 108, 30—32).—Os, as OsO_4 , gives a very sensitive blue coloration on filter-paper impregnated with aq. $K_2Fe(CN)_6$ or benzidine. By boiling the solution, and directing the vapour + OsO_4 on to the spot of reagent, 0.001 mg. of Os per c.c. may be detected in presence of all other cations. J. S. A.

Platinum resistance thermometry. IV. Determination of constants in Van Dusen's equation. M. MATSUI, Z. KURODA, and R. YUMEN (J. Soc. Chem. Ind. Japan, 1936, 39, 472—475B).—In order to extend the scale of instruments down to -190° , consts. have been determined, the equation becoming
$$0.0_{11}442(t - 100)^3 = 1 + 0.0039701t - 0.0_{15}5841t^2 - 0.0_{11}442(t - 100)^3.$$
 C. R. H.

Heat changes of slow reactions. I. Methods of continuous calorimetry. R. SANDRI (Monatsh., 1936, 68, 415—430).—The heat developed during slow reactions may be determined by normal adiabatic calorimetry, the amount of heat developed and stored in the calorimeter being measured, or by measuring the heat flow to the surroundings. The sources of error of the processes, calibration, and the correction of the results are discussed. The former method is applicable only to large amounts of reactants and the second only to small amounts. An advantage of the second method is that the measurements are isothermal and a thermostat may contain several calorimeters at the same time. Suitable apparatus is described. J. W. S.

Apparatus for constant temperature. R. E. COKER and E. W. CONSTABLE (Science, 1936, 84, 581—582). L. S. T.

Thermocouple gauge for vacuum measurement. G. C. DUNLAP and J. G. TRUMP (Rev. Sci. Instr., 1937, [ii], 8, 37—38).—The construction of a simple gauge is described. The couple is Nichrome—"Advance." C. W. G.

Diphenylmethane calorimeter. K. S. EVSTROPIEV (J. Phys. Chem. Russ., 8, 1936, 130—133).—

The calorimeter described by Schtschukarev *et al.* (A., 1934, 748) is improved by excluding gas bubbles by twice crystallising CH_2Ph_2 in a vac. E. R.

Cryoscopy in camphor. J. F. DURAND (Bull. Soc. chim., 1937, [v], 4, 67—71).—The micro-method for mol.-wt. determination described is a modification of that of Rast (A., 1922, ii, 421). E. S. H.

Simplified procedure for determining normal b.p. by the comparative method [of Swientoslawski]. M. WOJCIECHOWSKI (Nature, 1936, 138, 1096). L. S. T.

Colour measurement of opaque surfaces. E. R. BOLTON and K. A. WILLIAMS (Analyst, 1937, 62, 3—10).—The surface to be tested is illuminated by a beam incident at 45° , the intensity at a no. of λ of the scattered light reflected at 90° being determined photo-electrically after passing through Wratten or Ilford filters. A standard white surface is prepared by smoking with burning Mg. E. C. S.

Colorimetry with a spectrometer. R. A. HOUSTOUN and A. J. YOUNGER (Phil. Mag., 1937, [vii], 23, 49—63; cf. A., 1933, 1265; 1934, 748).—Beams of white and monochromatic light, both plane-polarised, and with their planes of polarisation at right angles, are superposed and viewed through an analysing nicol prism, rotation of which gives a complete series of "monochromatic plus white" mixtures. These are compared with the unknown colour. The use of the method is discussed. A. J. E. W.

Photo-electric microcolorimeter. K. A. EVELYN and A. J. CIPRIANI (J. Biol. Chem., 1937, 117, 365—369).—Modifications of the instrument already described (A., 1936, 1223) permitting the absorption of small samples (0.1—2.0 c.c.) or very thin layers of highly absorbing substances to be measured are described. F. A. A.

Colorimetry with a series of standards. V. G. GUREVITSCH (J. Gen. Chem. Russ., 1936, 6, 1433—1443).—A series of colour standards of increasing intensity is prepared, such that it is just possible to distinguish each standard from the neighbouring ones, when the concn. of substance responsible for the coloration is given by $y = ae^{-bx}$ (x = serial no. of standard, a and b are consts.). The vals. of a and b are determined for a no. of colorimetric methods [NO_2' , NO_3' , As, P, NH_3 , $CuSO_4$, picric acid, $C_6H_4(NO_2)_2$, dinitrophenol, $C_6H_3Cl(NO_2)_2$], and the prep. of permanent colour standards for each method is described. R. T.

Sensitivity of double-layer radiometer. M. L. VEINGEROV (Physikal. Z. Sovietunion, 1936, 9, 580—587).—The sensitivity of the radiometer can be increased by blackening a small area of the surface and concentrating the radiation on that area. The min. energy which can be measured with an accuracy of 1% is calc. to be 0.34×10^{-8} watt. O. D. S.

Illustration of the use of optical lattices for X-ray spectroscopy. W. KOSSEL (Physikal. Z., 1936, 37, 855—856).—A demonstration experiment in which the lattice for X-ray spectroscopy is replaced by one with a lattice const. of 1—2 mm., and visible light is used, is described. A. J. M.

High-dispersion prism spectrographs and barometric pressure. A. ELLIOTT and W. H. B. CAMERON (*J. Sci. Instr.*, 1937, **14**, 28—30).—The need for eliminating spectral line shifts due to changes of temp. and atm. pressure when using a multi-prism spectrograph is discussed, and methods of effecting this in the case of a Littrow spectrograph are described. N. M. B.

Condensing monochromator for X-rays. I. FANKUCHEN (*Nature*, 1937, **139**, 193—194).—Crystals of pentaerythritol ground at a suitable angle are convenient for increasing the concn. of monochromatic X-rays. The use of monochromatic radiation establishes the spurious nature of the innermost halo observed (*A.*, 1937, III, 71) with conc. solutions of tobacco mosaic virus. L. S. T.

Layer-line and Debye photographs by means of the characteristic X-rays of the crystal itself. C. FINBAK and O. HASSEL (*Nature*, 1937, **139**, 194—195). L. S. T.

X-Ray goniometer using beams of large aperture for photographically recording crystal-powder reflexions. J. C. M. BRENTANO (*Proc. Physical Soc.*, 1937, **49**, 61—77).—The construction and use of an instrument designed in relation to the factors determining the various aberrations of X-ray reflexions from microcryst. powders are described. Discussions and data for powder layers with spherical and toroidal surfaces are given. N. M. B.

Polarisation photometer for the visual determination of differences in blackening and its application in photographic spectral photometry. M. PESTEMER and G. SCHMIDT (*Monatsh.*, 1936, **69**, 399—419).—Sources and magnitudes of errors in spectral photometry by the method of comparison spectra are discussed. A new form of polarisation photometer is described and the application of blackening differences measured thereby to extinction measurements explained. By interpolation of the blackening difference-extinction curve the accuracy of determination of the extinction coeff. is 1—2% even in band max. J. W. S.

Apparatus for determining the electrokinetic potentials of powdered substances. V. M. GORTIKOV (*Kolloid. Shur.*, 1935, **1**, 233—238).—The diaphragm is made by centrifuging a suspension of the powder. Electro-osmosis through diaphragms of BaSO₄, soils, and kaolin was measured. J. J. B.

Physical methods in chemical laboratories. XXXIII. Polarographic methods in the laboratory. A. WINKEL and G. PROSKE (*Angew. Chem.*, 1937, **50**, 18—25).—Polarographic methods and their application to org., inorg., and micro-analysis, to the determination of constitution, and to the solution of kinetic problems are described. C. R. H.

Photo-counters in the study of chemi- and bio-luminescence: Gurwitsch effect. C. MAXTA (*Atti V Congr. Naz. Chim.*, 1936, **2**, 798—808).—A crit. survey of the various methods, depending on the use of photo-electric counters, which have been used in investigating mitogenetic radiation. The negative results obtained by certain workers are con-

sidered to be due mainly to the use of counters which are not sufficiently sensitive. O. J. W.

High-speed counter circuit of the Neher-Harper type. W. F. LIBBY, D. D. LEE, and S. RUBEN (*Rev. Sci. Instr.*, 1937, [ii], **8**, 38).—Improvements are described (cf. *A.*, 1936, 1084). C. W. G.

Effect of hydrogen on the time-lag of argon-filled photo-electric cells. N. R. CAMPBELL and R. S. RIVLIN (*Proc. Physical Soc.*, 1937, **49**, 12—13).—The proportion of H₂ required to produce the decrease in time-lag previously reported (cf. *B.*, 1936, 844) has been determined by means of a Pirani gauge. N. M. B.

Influence of low temperature on photo-electric cells. A. AMERIO (*R. Ist. Lombardo Sci. Let. Rend.*, 1935, [ii], **68**, 735—741; *Chem. Zentr.*, 1936, i, 1813).—Ti₂S cells show a decreased conductivity κ at low temp., the ratio κ (light) : κ (dark) being > at room temp. Se cells show a decreased sensitivity at low temp. J. S. A.

Continuously acting cloud-chamber. H. BRINKMAN (*Proc. K. Akad. Wetensch. Amsterdam*, 1936, **39**, 1185—1186).—A new form of cloud-chamber in which the gas is periodically expanded and compressed is described. The H₂O vapour becomes supersaturated during expansion, and for certain expansion ratios condensation occurs only on the ions. The homogeneity of the concn. of H₂O vapour is restored during compression. J. W. S.

Method for taking electron diffraction photographs with simultaneous irradiation of two samples. V. VERZNER (*Physikal. Z. Sovietunion*, 1936, **9**, 549—550).—The diffraction cones from two adjacent irradiated samples are separated by a brass screen in the diffraction camera. O. D. S.

Apparatus for detecting pyroelectricity. H. LE QUÉRÉ (*Bull. Soc. Franç. Min.*, 1936, **59**, 137—142). L. S. T.

Electron microscope. L. C. MARTIN, R. V. WHELPTON, and D. H. PARNUM (*J. Sci. Instr.*, 1937, **14**, 14—24).—A new two-stage electron microscope for the microscopy of small objects by means of electron beams is described. An optical microscope is included, and any object detail can be brought from the optical to the electron system. The focussing coils are mounted in the vac., and the various parts can be centered on the electron beam axis. N. M. B.

Electrical apparatus for semi-micro-determination of nitrogen. A. CONTARDI and S. ERIGHIAN (*R. Ist. Lombardo Sci. Let. Rend.*, [ii], **68**, 702—706; *Chem. Zentr.*, 1936, i, 1922).—A Dumas method, with electrical heating, using 20—50 mg. of material, is described. J. S. A.

Electric and magnetic focussing in mass spectroscopy. A. J. DEMPSTER (*Physical Rev.*, 1937, [ii], **51**, 67—69).—The theory is discussed for a type of instrument in which an electric field forms a real image of the entrance slit with rays of one velocity near the entrance to a magnetic field, and in which the velocity dispersion due to the electric field is

counterbalanced by the velocity dispersion in the magnetic field. N. M. B.

Theory of the electrostatic beta-particle energy spectrograph. F. T. ROGERS, jun. (Rev. Sci. Instr., 1937, [ii], 8, 22—24).—The equations necessary for the use of the electrostatic velocity analyser as an energy spectrograph for β -particles are derived.

C. W. G.

Simple equipment for electrolysing heavy water. C. M. SLACK and L. F. EHRKE (Rev. Sci. Instr., 1937, [ii], 8, 39).—The circuit is automatically broken before the level of liquid can change sufficiently to allow the gases to mix.

C. W. G.

Conductometric apparatus for fast reactions. E. EFTRING (Svensk Kem. Tidskr., 1936, 48, 276—281).—A method which gives accurate results for reactions complete in 30 sec. is described.

M. H. M. A.

Standard quinhydrone electrode. V. SCHOMAKER and D. J. BROWN (Ind. Eng. Chem. [Anal.], 1937, 9, 34—35).—The prep. and advantages of a quinhydrone half-cell, in which the solution is K tetroxalate, saturated at 0°, are described.

E. S. H.

Automatic recording of magnetisation curves. W. STEINHAUS and E. SCHOEN (Physikal. Z., 1937, 38, 1—5).—Apparatus for the photographic recording of magnetisation curves for all types of ferromagnetic materials is described.

A. J. M.

Micro-Kjeldahl apparatus. J. E. SCOTT and E. S. WEST (Ind. Eng. Chem. [Anal.], 1937, 9, 50).—Modified apparatus is described.

E. S. H.

Automatic Orsat apparatus.—See B., 1937, 9.

Apparatus for determining carbon dioxide in stone dust.—See B., 1937, 133.

Carbon monoxide analyser and indicators.—See B., 1937, 133.

Filters for sampling industrial dusts.—See B., 1937, 2.

Obtaining dust samples from mine air.—See B., 1937, 2.

Simplest and most accurate viscosimeter and other instruments with suspended level.—See B., 1937, 1.

Precision recording dilatometer.—See B., 1937, 96.

Surface tension of solid substances. R. N. J. SAAL and J. F. T. BLOTT (Physica, 1936, 3, 1099—1110).—A review and discussion of methods of determining σ for solids. Different methods give results in poor agreement, and none gives a true measure of σ .

A. J. E. W.

Determination of the surface tension of a liquid by the formation of drops at the bottom of a capillary tube in which the linear move-

ment of the meniscus is observed. G. DUCH (Compt. rend., 1936, 203, 1336—1338).— σ is deduced from the movement of the liquid meniscus in a capillary during the formation and detachment of a drop of the liquid at the lower end.

H. J. E.

Sealing metallic wires in glass. M. E. RINCK (Bull. Soc. chim., 1937, [v], 4, 199—200).

E. S. H.

Technique of measuring swelling. T. P. TIA-SHELOVA (Kolloid. Shur., 1935, 1, No. 1, 91—95).—An apparatus is described.

J. J. B.

Complete gravimetric analysis by precipitation directly in Jena glass filter crucibles. G. G. LONGINESCU and I. I. PRUNDEANU (Bull. Acad. Sci. Roumaine, 1936, 18, No. 6—7, 1—7).—In the analytical technique described, pptn. is effected directly in the Gooch crucible, filtration being performed without any ageing of the ppt.

J. S. A.

Low-capacity orifice-meters of glass. I. For liquid measurement. II. For gas measurement. S. HATTA, M. KATORI, and U. ITÔ (J. Soc. Chem. Ind. Japan, 1936, 39, 406—410B).—I. An apparatus for the measurement of a low rate of flow is described, and a theory is given.

II. The application to gas flow, and the necessary modification in the theory, are described.

T. W. P.

Automatic regulators.—See B., 1937, 96.

Production of water with very small conductivity. K. GOSTKOWSKI (Acta phys. polon., 3, 75—80; Chem. Zentr., 1936, i, 1827).—A distillation apparatus coated internally with paraffin is described.

J. S. A.

Induction pump for liquid mercury. E. S. GILFILLAN, jun., and S. N. MACNEILLE (Rev. Sci. Instr., 1937, [ii], 8, 28—34).—Polyphase current flowing through coils wound around two concentric tubes induce currents in Hg in the annular space. The Hg may be lifted to >1 m. and speeds >50 c.c. per sec. can be obtained.

C. W. G.

Determining the speed of air-driven centrifuges. H. SHAPIRO and C. BUTT (Rev. Sci. Instr., 1937, [ii], 8, 35).—Lissajou figures are obtained in a cathode-ray oscillograph by the application of two potentials of different frequencies, one known and the other unknown. The latter is obtained by reflexion from the centrifuge, of which the frequency is estimated from the shape of the figure produced.

C. W. G.

Ozoniser. W. SHEEHAN and W. CARMODY (Ind. Eng. Chem. [Anal.], 1937, 9, 8).—Simple laboratory apparatus is described.

E. S. H.

Dobereiner's catalytic researches. E. THEIS (Angew. Chem., 1937, 50, 46—50).—An historical lecture.

C. R. H.

Theory and experiment in exact science. W. GERLACH (Angew. Chem., 1937, 50, 10—18).—A lecture, with examples drawn from recent advancements in physics and chemistry.

C. R. H.

Geochemistry.

Electrical conductivity of air in a potash mine in Catalonia. C. DAUZERE (Compt. rend., 1937, 204, 38—39).— κ for air in the mine was $<$ for air on the surface, probably owing to effects of dust and ventilation. κ was high in the neighbourhood of large masses of material of high [K], the increase being attributed to ionisation by radioactive K.

A. J. E. W.

Microscopic examination of fog-, cloud-, and rain-droplets. N. FUCHS and I. PETRJANOFF (Nature, 1937, 139, 111—112).—A method of measurement is described.

L. S. T.

Re-determination of the deuterium-protium ratio in normal water. J. L. GABBARD and M. DOLE (J. Amer. Chem. Soc., 1937, 59, 181—185).—Lake Michigan H_2O has D : H = 1 : 6900. E. S. H.

Mineral waters of Venetia. Chemical and physico-chemical analysis and classification according to Marotta and Sica. G. BRAGAGNOLO (Annali Chim. Appl., 1936, 26, 460—475).—A summary of the analyses of the waters (5 oligo-mineral, 44 indifferent mineral, 18 mineral, 2 hypothermal, 2 thermal, and 5 hyperthermal) is given.

L. A. O'N.

Representation of the composition of mineral waters. G. BRAGAGNOLO (Atti V Congr. Naz. Chim., 1936, 2, 703—706).—From the composition of a mineral H_2O and from the activities of the dissolved ions calc. by means of Bonino's theory the activity coeff. of the H_2O is calc.

O. J. W.

Analysis of the water, gas, and mud of the "prehistoric" thermes of the Montegrotto thermes (Colli euganei). E. MAMELI and U. CARRETTA (Annali Chim. Appl., 1936, 26, 475—488).—The H_2O is hyperthermal, radioactive, and contains Na^+ , K^+ , Ca^{++} , Mg^{++} , Cl^- , Br^- , I^- , SO_4^{--} , and HCO_3^- , CO_2 , O_2 , and N_2 , and suspended SiO_2 . The gas is chiefly N_2 with a little CO_2 , O_2 , and CH_4 . The sediment contains Fe, Ca, CO_3 , SiO_2 , and org. matter. The mud is radioactive and contains Ca, Al, Fe, CO_3^{--} , SiO_2 and org. matter.

L. A. O'N.

Change during the year of the salt content of the River Grushevka. P. KASCHINSKI (Hydrochem. Mat., U.S.S.R., 1936, 9, 122—142).—The greatest content of minerals was found in July and in winter (separation of ice).

R. S. B.

Boron content of mineral waters and mud of the U.S.S.R. I. E. S. BURKSER and M. J. SCHAPIRO (Hydrochem. Mat., U.S.S.R., 1936, 9, 154—163).—A discussion.

R. S. B.

Determination of content of alkali metals in water, and water from soil and sea mud. P. KASCHINSKI (Hydrochem. Mat., U.S.S.R., 1936, 9, 143—153).—For most samples of H_2O , unless the alkali content is large and very disproportionate in K and Na, the total content of alkali metal, calc. neglecting the difference in equiv. wts., differs by 3% from the direct determination.

R. S. B.

Mud deposits of the Chansche Sea. G. P. ALFERIEV (Hydrochem. Mat., U.S.S.R., 1936, 9, 102—121).

R. S. B.

Results of analysis for the mud from Chansche and Gniloje Seas (near Eisk) in 1932, and brine tests. P. KASCHINSKI and K. LAZAREV (Hydrochem. Mat., U.S.S.R., 1936, 9, 51—94).—The brine from both seas was practically identical. The relative content of KCl and $MgSO_4$ has increased and that of NaCl decreased since 1928. The H_2O from mud contains CO_3^{--} from micro-organisms.

R. S. B.

Radioactivity of mud taken in 1932 from the Gniloje Sea. K. LAZAREV (Hydrochem. Mat., U.S.S.R., 1936, 9, 95—101).—On the average 100 g. of fluid and dry mud contain 0.3 and 0.8 units, respectively, compared with 0.05 unit in 1926.

R. S. B.

Boron in brine and the salt deposits of the Ukraine. II. J. D. GNESIN and L. S. DOROSINSKI (Hydrochem. Mat., U.S.S.R., 1936, 9, 164—169).—From 30 tests it is concluded that there is no B in the salt deposit and rocks in the region of Donbass (U.S.S.R.).

R. S. B.

New phosphate, bermanite, occurring with triplite in Arizona. C. S. HURLBUT, jun. (Amer. Min., 1936, 21, 656—661).—Bermanite, $(Mn^{II}, Mg)_5 Mn^{III}_3 (PO_4)_8 (OH)_{10} \cdot 15H_2O$, orthorhombic, occurs as a reddish-brown mineral; hardness 3.5, d 2.84; n_a 1.687, n_g 1.725, n_r 1.748 (all ± 0.003), a_0 6.25, b_0 8.92, c_0 19.61 Å. (X-ray measurements), Fe_2O_3 3.03, Mn_2O_3 28.76, MnO 13.79, MgO 2.39, CaO 0.72, Na_2O 0.32, H_2O 19.33, P_2O_5 31.39, total 99.73% [analyst F. A. GONYER].

L. S. T.

Chlorite. A. N. WINCHELL (Amer. Min., 1936, 21, 642—651).—A revised correlation (cf. *ibid.*, 1928, 13, 161) of variations in optical properties and chemical composition incorporating additional data.

L. S. T.

Magnetite metacrysts. G. M. SCHWARTZ (Amer. Min., 1936, 21, 635—641).—Examples which show that magnetite forms metacrysts, especially in metamorphosed Fe formations and chlorite schists, are cited and their origin is discussed.

L. S. T.

Babingtonite and epidote from Westfield, Massachusetts. C. PALACHE (Amer. Min., 1936, 21, 652—655).—Analyses are given.

L. S. T.

Occurrence of bauxite in Montenegro. G. PETUNNIKOV (Montan. Rundsch., 1935, 27, No. 23, 1—7; Chem. Zentr., 1936, i, 1476).—The composition and extent of good quality bauxite deposits are discussed.

J. S. A.

Paragenesis of kyanite-eclogites. C. E. TILLEY (Min. Mag., 1936, 24, 422—432).—Analyses of pyroxenes and garnets are tabulated and plotted on a triangular diagram together with analyses of kyanite-eclogites and kyanite-free eclogites. The points for these two rock types lie on either side of a line joining the pyroxene and garnet points. New analyses are given of a kyanite-eclogite and the contained pyroxene and garnet from Weissenstein, Bavaria.

L. J. S.

Crystal structure of krennerite. G. TUNELL and C. J. KSANDA (J. Washington Acad. Sci., 1936, 26, 507—509).—The unit cell has a_0 16.51, b_0 8.80,

c_0 4.45 Å., all ± 0.03 Å., and contains 8 mols. of AuTe_2 . Ag is held mainly in solid solution. The nature of the space-group is discussed. R. S.

Strange morphology of calaverite in relation to its internal properties. G. TUNELL and C. J. KSANDA (J. Washington Acad. Sci., 1936, 26, 509—528; cf. A., 1935, 286).—The authors' results and those of previous workers relative to the morphology of calaverite are discussed in detail. It is not a polymorph of krennerite, nor does it consist of aggregates of differently oriented grains. Only one structural lattice is present and this is closely related to the simple S faces. The complex faces are connected with the appearance of adventive diffraction spots in the X-ray spectra, but a complete explanation of both phenomena is lacking. R. S.

Formation of metal enrichments in mid-German copper schists. G. GILLITZER (Metall u. Erz, 1935, 32, 533—542; Chem. Zentr., 1936, i, 1200).

H. J. E.

Analysis of monazites from the Aldan and S. Yenisei auriferous deposits. V. K. ZEMEL (J. Appl. Chem. Russ., 1936, 9, 1969—1971).—Aldan monazite contains 14.9% ThO_2 , as compared with 0.26% in S. Yenisei monazite. The content of individual rare-earth elements is the same in both deposits. R. T.

Monazite of Shinkolobwe (Katanga). J. THOREAU, R. BRECKPOT, and J. F. VAES (Bull. Acad. roy. Belg., 1936, [v], 22, 1111—1122).—The mineral occurs in small, topaz-yellow, polyhedral prisms with the {111}, {101}, {110}, and {100} faces well developed, and the {210}, {011}, {111}, and {311} faces much less so. Analysis gave SiO_2 0.95, P_2O_5 24.90, CaO 0.37, CeO_2 32.29, ThO_2 0.2, other rare earths 41.63%, traces of MgO and Fe_2O_3 , total 100.34. Spectrographic analysis showed the presence, qualitatively, of Ga, Sa, Nd (high), Pr, La, Y (<0.1%), Mo, Ni, Ti, Pb, B, traces of Co, and of 0.1% Th. R. C. M.

Transfusion of quartz xenoliths in alkali basic and ultrabasic lavas, S.W. Uganda. A. HOLMES [with F. HECHT] (Min. Mag., 1936, 24, 408—421).—Blocks of quartz enclosed in lava show a rim of augite, and material transfused from the lava has penetrated between the quartz grains with the development of glass. Chemical analyses are given of the glass (SiO_2 79%) and of some new types of lava. L. J. S.

Twisted [crystals of] quartz. G. LAEMMLEIN (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 279—282).—Crystals from the northern Urals show a sub-parallel growth of sub-individuals with the zone-axis [1213] in common. L. J. S.

Physical properties of certain iron oxides. W. H. NEWHOUSE and J. P. GLASS (Econ. Geol., 1936, 31, 699—711).—A mineral with the properties and occurrence of magnetite replaces magnetite (I) from a no. of localities. It replaces titaniferous as well as non-titaniferous (I) and its composition varies from $(\text{Fe,Ti})_2\text{O}_3$ to Fe_2O_3 . It may be a weathering product, but probably it may also be formed by certain hydrothermal or late magmatic processes. In certain respects it corresponds with, but is not

identical with, the ferromagnetic Fe_2O_3 from Iron Mountain, California. X-Ray and magnetic data are discussed. L. S. T.

Colloidal tin ore deposits. R. HERZENBERG (Econ. Geol., 1936, 31, 761—766).—A theory of colloidal origin of some of the Sn ore deposits of Bolivia, involving oxidation of thiostannate solutions to unstable sols of colloidal stannic acid and pptn. and coagulation of stannic acid gel, is advanced. L. S. T.

Granites of the Malayan tin belt compared with tin-granites from other regions. J. WESTERVELD (Proc. K. Akad. Wetensch. Amsterdam, 1936, 39, 1199—1309).—The petrological properties and chemical composition of Malayan Sn-granites are described and compared with those of Cornwall, Saxony, Finland, Bolivia, and Transvaal. J. W. S.

Sericitisation of pegmatites in the Gdov district, Leningrad. P. M. MURZAEV (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 265—268).—In a recently discovered outcrop of biotite-gneiss beneath Palaeozoic rocks the feldspar is altered to a fine scaly aggregate of sericite. This is believed to be due to hydrothermal action, whereas in northern Karelia a similar product is produced by surface weathering. L. J. S.

Alkaline and acid solutions in hypogene zoning at Cerro de Pasco. L. C. GRATON and S. I. BOWDITCH (Econ. Geol., 1936, 31, 651—698).—The relations and sequence of alkalinity and acidity in the solutions responsible for the sulphide deposits and associated wall rock alteration at Cerro de Pasco, Peru, are described and discussed. L. S. T.

Fatigue in rock exfoliation. D. T. GRIGGS (J. Geol., 1936, 44, 783—796).—Subsection of a coarse-grained granite to temp. differences of 110° for a period corresponding with 244 years of natural insolation produced no surface changes apparent in a photomicrograph. When the effect of H_2O is superimposed on temp. changes a marked change quickly appears in the specimen. L. S. T.

Characteristics of Italian metalliferous deposits in basic rocks. A. STELLA (Atti R. Accad. Lincei, 1936, [vi], 23, 830—838).—The classification of the various deposits according to their probable modes of formation is discussed. O. J. W.

Xenotime nodules from Kawabe. Composition of Ishikawa xenotime. S. IMORI and J. YOSHIMURA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 17—21).—Grey nodules with botryoidal surfaces have been found near Ishikawa, embedded in feldspars. The composition after allowing for inclusions of Zr is P_2O_5 29.08, SiO_2 2.04, $(\text{Nb,Ta})_2\text{O}_5$ 0.36, TiO_2 0.03, Y earths 51.87, Ce earths 4.58, ThO_2 2.20, ZrO_2 2.66, UO_3 1.09, Al_2O_3 1.37, Fe_2O_3 0.94, CaO 0.79, ignition loss 3.00%. R. S. B.

Weathering of rocks and composition of clays. A. SALMINEN (Ann. Acad. Sci. fenn., 1935, A, 44, No. 6, 139 pp.; Chem. Zentr., 1936, i, 2176).—Differences of weathering development are attributed to variation in the reaction of soil solutions. In Northern districts and lacustrine conditions, with acidic soil- H_2O , enrichment of SiO_2 occurs. Moist climates and maritime weathering, with alkaline soil- H_2O , tend

to enrich Al_2O_3 and Fe_2O_3 . In Finland weathering is pronounced only where soil- H_2O has a high $[\text{H}_2\text{SO}_4]$. The finer mechanical constituents of clays, independent of age, are richer in basic constituents than are the coarser particles. This effect outweighs chemical weathering in the case of Finnish clays. J. S. A.

Mineral constitution of various ceramic clays.—See B., 1937, 37.

Chlorine content of the Leda clay [from Waterville, Maine]. A. S. KNOX (Science, 1936, 84, 419—420).—The vals. obtained varied from 0.0000731 to 0.0000789 g. of Cl per g. of clay. Their geochemical significance is discussed. L. S. T.

Analyses of Tertiary igneous rocks from Antrim and Staffa. A. HOLMES (Proc. Roy. Irish Acad., 1936, 46, B, 89—94).—Detailed analyses are given of olivine-basalt, basalt, olivine-dolerite, and rhyolite. L. J. S.

Distribution of rare-earth elements in certain auriferous deposits. V. K. ZEMEL (J. Appl. Chem. Russ., 1936, 9, 1972—1984).—The auriferous deposits contain the entire complex of chalcophilic elements. Bi and Te, but not Ga, Ge, or In, tend to concentrate in Au ores. Certain deposits have a considerable content of rare-earth elements. R. T.

Action of sulphide minerals on solutions of gold and platinum salts. O. E. ZVJAGINTZEV and E. L. PISARSHEVSKAJA (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 73—74).—The actions of powdered galenite, sphalerite, pyrite, and chalcopyrite on solutions of Na_2PtCl_6 and H_2PtCl_6 have been investigated. After 1—1.5 months the galenite contained about 20% Pt as PtS_2 . Reaction with the other minerals is slow. O. D. S.

Hydro-amphibole from South Devon. W. Q. KENNEDY and B. E. DIXON (Z. Krist., 1936, 94, 280—287).—A low-grade metamorphic amphibole from the Start peninsula, S. Devon, has been examined chemically and optically, and its chemical constitution is discussed in relation to the abnormal H_2O content and the Warren formula. B. W. R.

Sepiolites. G. MIGEON (Bull. Soc. Franç. Min., 1936, 59, 6—134).—A detailed investigation of the group. Analyses of 32 samples from different parts of the world are summarised; for the majority the ratio $\text{SiO}_2:\text{MgO}$ is 1.50. In 12 new samples from other localities the ratio is 1.30 to 1.70. Dehydration and dilatometric changes with temp. up to 1100° have been determined, and the corresponding changes in the lattice have been followed by means of X-rays. The zeolitic properties are discussed. The general formula is $\text{Si}_4\text{O}_{11}(\text{MgH}_2)_3\text{H}_2\text{O}(\text{H}_2\text{O})_n$, where $(\text{H}_2\text{O})_n$ represents zeolitic H_2O and Mg corresponds with $\text{Mg} + \text{Ca} + \text{Fe}$. The monohydrate begins to decompose at approx. 350° , and at approx. 750° $\text{Si}_4\text{O}_{11}(\text{MgH}_2)_3$ breaks down with the formation of enstatite. $a:b:c$ is probably 1.47:1:0.338. L. S. T.

Bituminous tripolites of Sicily. P. LEONE, F. CIPOLLA, and S. VINI (Atti V Congr. Naz. Chim., 1936,

2, 785—788).—A geological and chemical description of the tripolite deposits of Serradifalco in Caltanissetta, which contain 14—19% of oil. O. J. W.

Native bismuth and bismutite from Ishikawa. S. HATA (Bull. Inst. Phys. Chem. Res. Japan, 1936, 15, 1291—1292).—Native Bi, d 9.84, contained Bi 98.0, Pb 1.0, Sb 0.2, V 0.2, Fe 0.1, Mn + Zn 0.2, CaO 0.8, SiO_2 0.3%. Bismutite, $3\text{Bi}_2\text{O}_3 \cdot 2\text{CO}_2 \cdot 0.5\text{H}_2\text{O}$, d 7.02, contained Bi_2O_3 89.03, CO_2 5.99, PbO 1.01, Sb_2O_3 0.24, V_2O_5 0.30, Fe_2O_3 0.51, CaO 0.30, SiO_2 1.17, Al_2O_3 0.32, MgO 0.10, S 0.08, $\text{H}_2\text{O} +$ 0.72, $\text{H}_2\text{O} -$ 0.60%. R. S.

Classification of "pelagosite" as a new type of calcareous alga. M. AIROLDI (Atti R. Accad. Lincei, 1936, [vi], 24, 18—23).—The mineral pelagosite (CaCO_3 79.47, SrCO_3 2.27, MgCO_3 3.13, org. matter 2.10%) originates from a calcareous alga for which the name *Sclerothamnium nitens* is proposed. F. O. H.

Palygorskites. H. LONGCHAMON (Compt. rend., 1937, 204, 55—58).—X-Ray diffraction data are given, and the behaviour on heating is described and discussed. Observed analogies confirm that the palygorskites are related to the sepiolites by isomorphous replacement of Mg by Al. A. J. E. W.

Fluorine content in Chinese common salt.—See B., 1937, 33.

Analysis of pietra di Trani [limestone].—See B., 1937, 33.

Heavy mineral assemblages of soils from the goldfields of Western Australia. D. CARROLL (Geol. Mag., 1936, 73, 503—511).—Mineralogical analyses of soil from the Au-bearing belt of W. Australia show that the character of the heavy residue of a soil often gives an indication of the nature of the parent rock. In most of the localities examined the soils have been formed *in situ* by weathering of the underlying rocks. L. S. T.

Fossil carbon in the Mesozoic of Longobucco in Calabria. F. PENTA (Atti R. Accad. Lincei, 1936, [vi], 23, 794—801).—The physical and microscopic properties are described. A summary of the action of 10% HNO_3 on various fossil carbons is given. O. J. W.

Marahunite, a boghead coal in the lignite stage. O. STUTZER (Z. deut. geol. Ges., 1935, 87, 616—620; Chem. Zentr., 1936, i, 1351). H. J. E.

Structure of tectonic coals. W. E. PETRASCHECK (Z. deut. geol. Ges., 1935, 87, 622—632; Chem. Zentr., 1936, i, 1351). H. J. E.

Biogenic spontaneous heating of peat. B. L. ISATSCHENKO and M. N. MALTSHEVSKAJA (Compt. rend. Acad. Sci. U.R.S.S., 1936, 4, 377—380).—The spontaneous heating of peat (50—80 cm. below the surface) is a biogenic process promoted by various micro-organisms acting in a moist and aerated medium, followed by chemical decomp., the nature of which is outlined. F. N. W.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

APRIL, 1937.

Fine structure of the Balmer lines. B. S. M. RAO (Proc. Indian Acad. Sci., 1937, 5, A, 56—62; cf. Spedding, A., 1935, 271).—In view of the disagreement between calc. and observed term vals. (cf. Williams, A., 1934, 575) the order of magnitude of the corrections obtained by taking into account the interaction of the electron and its own radiation field is estimated on the basis of Born's field theory. Results indicate that the corrections involved are negligible (cf. Meixner, A., 1935, 1050; this vol., 1).

N. M. B.

Spectrum of H₂ from 3612 to 4224 Å. N. A. KENT (Astrophys. J., 1936, 84, 585—599).—New $\lambda\lambda$ for 512 lines of H₂ are listed and compared with those given by previous investigators.

L. S. T.

Far ultra-violet emitted by electrical discharges in air at reduced pressure. G. DECHENE (Compt. rend., 1937, 204, 249—251).—Nine lines in the Lyman and Schumann regions were observed, seven being due to N₂ or O₂.

A. J. E. W.

Further study of the Vegard-Kaplan bands. J. KAPLAN (Physical Rev., 1935, [ii], 48, 482).

L. S. T.

Effect of foreign molecules on the absorption of oxygen in the Schumann region. E. G. SCHNEIDER (J. Chem. Physics, 1937, 5, 106—107).—The adsorption of O₂ at λ of approx. 1450 Å. is not influenced by added N₂ at low pressures.

W. R. A.

Glow of barrier anodes of aluminium. K. GUMINSKI (Bull. Acad. Polonaise, 1936, A, 457—469).—The glow emitted by Al barrier anodes consists of a structureless band in the blue-green, which is extended toward the red by the addition of other metals, and shifted to longer $\lambda\lambda$ by increasing the p.d. The emission of the glow is conditioned by the presence of a well-formed oxide layer. The origin of the glow is discussed, and is correlated with the action of the barrier-layer photo-cell.

J. S. A.

Cl-I like spectra. Cl I, A II, K III, Ca IV, Ti VI, V VII, Cr VIII, Mn IX, Fe X, and Co XI. B. EDLÉN (Z. Physik, 1937, 104, 407—416).—The electron jump $3s^23p^5 - 3s^23p^44s$ gives rise to groups of lines which have been identified and measured from Ti VI to Co XI. From 6 to 11 lines have been measured for each spectrum and the average λ ranges from 200 Å. for Ti VI to 83 Å. for Co XI. Relative term vals. and ionisation potentials are calc.

A. E. M.

High-frequency excitation of a spectrum in the far ultra-violet. M. HELLERMANN (Z. Physik, 1937, 104, 417—429).—Emission spectra were obtained from A, I, H₂, N₂, and NO in the region

2100 to 500 Å. at a pressure ~ 0.1 mm. Hg by high-frequency excitation ($\lambda = 6$ m.). New lines are recorded, particularly for I.

A. E. M.

Continuous flame spectrum of potassium. T. N. PANAY (Compt. rend., 1937, 204, 251—253).—Data for the intensity distribution in the range 4100—5600 Å. are given. A max. occurs at 4430 Å., and a min. at 5210 Å.

A. J. E. W.

Photometry of electric furnace absorption multiplets. R. B. KING and A. S. KING (Physical Rev., 1935, [ii], 48, 485).—The intensities of lines in multiplets of Fe of temp. classes I and II between 3650 Å. and 4500 Å. have been measured in absorption spectra produced in the electric vac. furnace.

L. S. T.

Zeeman effect in the arc spectrum of nickel. H. DIJKSTRA (Physica, 1937, 4, 81—103).—Data are recorded.

H. J. E.

Spectrum of singly ionised zinc. P. N. KALIA (Indian J. Physics, 1936, 10, 463—464).—Extended analysis of the spectrum of Zn II accounts for 33 of the lines discovered by Bloch and Bloch (A., 1934, 1051).

O. D. S.

Nuclear moment of the zinc isotope ⁶⁷Zn. J. M. LYSHEDE and E. RASMUSSEN (Z. Physik, 1937, 104, 434—439).—Satellites of the 4680, 4722, and 4810 Å. lines of the Zn triplet are ascribed to ⁶⁷Zn. From an analysis of their structure the nuclear spin $i = 5/2$ and the magnetic moment $\mu = 0.9$ nuclear magneton.

L. G. G.

Average life of the zinc atom in the ²³P₁ state, and the method of total absorption. P. SOLEILLET (Compt. rend., 1937, 204, 253—255).—The interpretation of Billeter's results is criticised, and his val. of 2.64×10^{-5} sec. corr. to 2.10×10^{-5} sec.

A. J. E. W.

Zeeman effect of the cadmium lines ⁵³P₀₁ 6³S₁. S. SATÔ (Sci. Rep. Tohoku, 1936, 25, 686—712).—The lines examined are $\lambda\lambda$ 5086, 4800, and 4678 Å.

H. J. E.

Quadrupole and magnetic moment of ¹¹⁵In. H. SCHULER and T. SCHMIDT (Z. Physik, 1937, 104, 468—471).—From fine structure of the In I line 4511 Å. the electric quadrupole moment $q = +0.8 \pm 0.2 \times 10^{-24}$. The best vals. for the magnetic moment μ of In and Tl are 5.3 ± 0.5 and 1.45 ± 0.1 nuclear magnetons, respectively.

L. G. G.

Structure of the spectra Sb VI and Te VII. L. BLOCH and E. BLOCH (Compt. rend., 1937, 204, 424—426).— $\lambda\lambda$ are tabulated, and an analysis is given.

A. J. E. W.

Electronic energy transfers between iodine and other molecules. J. R. BATES (J. Physical Chem., 1937, 41, 57—59).—The quenching efficiencies of various gases on I_2 fluorescence can be explained by assuming that deactivation results in dissociation, this being in accord with other results. J. W. S.

Rydberg series in I I. W. C. PRICE (Physical Rev., 1935, [ii], 48, 477).—A well-developed series has been found in Turner's data (A., 1926, 550) for the far ultra-violet spectrum of I I. An ionisation potential, but not the lowest, is 10.71 volts. L. S. T.

Electron concentration and spectral intensity distribution in a caesium discharge. F. L. MOHLER (J. Res. Nat. Bur. Stand., 1936, 17, 849—857).—The theory of electrical discharge in Cs vapour is discussed, and electron concn. and reversal temp. are calc. from the author's measurements. The effective cross-section of a 0.3-volt electron for recombination into the 6P level is 1.71×10^{-21} sq. cm. R. S. B.

First spark spectrum of caesium as excited by electron impact. R. R. SULLIVAN (Physical Rev., 1935, [ii], 48, 476).—Certain aspects of the optical excitation functions for several Cs II lines have been determined. L. S. T.

Spectra of barium and strontium. (MLLE.) M. PEREY (Compt. rend., 1937, 204, 244—246).— $\lambda\lambda$ of new lines in the spark spectra, in the range 2400—3800 Å., are tabulated. Variations in the spectra with different methods of excitation are described. A. J. E. W.

Broadening of the green line (5461 Å. Hg) in high-pressure mercury-vapour arcs. L. GRILLET (Compt. rend., 1937, 204, 426—429).—Measurements of the intensity distribution in the neighbourhood of 5461 Å., for two commercial arcs, are described and discussed. Extensive broadening of the line may occur. A. J. E. W.

Constancy of wave-length of a spectral line. G. C. OMER, jun., and J. L. LAWSON (Astrophys. J., 1936, 84, 477—478).—Using a Fabry-Perot etalon, the λ of the 4358 Hg line was found to be const. from June 24 to August 27, 1935. L. S. T.

Optical investigation of discharge in metal vapours. III. Influence of pressure on the radiation from discharges in mercury and cadmium vapour. V. FABRIKANT, A. KANEL, and F. BUTAEVA (Physikal. Z. Sovietunion, 1936, 10, 315—336; cf. this vol., 104).—In order to estimate the influence of reabsorption and of excitation potential on emission the curves of groups of lines having either the same upper or the same lower level were compared, and the variation with the angle of emission of the curve for the 5461 Å. line of Hg was investigated. O. D. S.

Comparative measurements of the anode fall region and the optical and electrical thickness of the anode fall region in light and heavy hydrogen. A. GÜNTHER-SCHULZE and H. SCHNITGER (Z. Physik, 1937, 104, 395—401).—The thickness of the anode fall region has been measured optically and electrically for ^1H and ^2H . In the pressure

range 0.6—2.3 mm. Hg the following relations were found: $p \times d_{\text{opt.}} = 1.36$ for ^1H and 1.24 for ^2H ; $p \times d_{\text{elect.}} = 5.0$ for ^1H and 6.3 for ^2H (in all cases p in mm. Hg and d in mm.). A. E. M.

A glow discharge. F. H. NEWMAN (Phil. Mag., 1937, [vii], 23, 239—241).—The new type of glow discharge observed by Günther-Schulze *et al.* (A., 1934, 125) has also been produced with the C and Fe arcs. A. J. M.

Increase of spark potential by irradiation. W. FÜCKS and W. SEITZ (Naturwiss., 1937, 25, 106).—An increase in the spark potential of A, He, N_2 , and air when the discharge was passed with Ag, Cu, Ni, and Zn cathodes was observed on irradiating the cathodes with ultra-violet light. The cathodes were not preheated in vac. The explanation of Schade (this vol., 55) that the increase is due to the presence of grease is unconvincing. A. J. M.

Theory of the broadening of spectral lines in a homogenous gas. Coupling breadth. V. FURSOV and A. VLASSOV (Physikal. Z. Sovietunion, 1936, 10, 378—412).—A classical and quantum-mechanical treatment of the coupling broadening at moderate pressures is given and the influence, at high pressures, of emission during collision is estimated. O. D. S.

Effect of the spectrometer on the width of spectral lines. R. C. SPENCER (Physical Rev., 1935, [ii], 48, 473; cf. A., 1936, 814).—Theoretical. L. S. T.

Theoretical interpretation of equivalent breadths of absorption lines. D. H. MENZEL (Astrophys. J., 1936, 84, 462—473). L. S. T.

Presence of molecular hydrogen in sun-spots. I. G. PICCARDI (Atti R. Accad. Lincei, 1936, [vi], 24, 212—215).—The conclusions of Swings (A., 1934, 471) are criticised. Both the experimental data of Langmuir and calculations based on Russell's formula show that the concn. of mol. H_2 in sun-spots is appreciable. O. J. W.

Forbidden transition in the spectrum of interstellar ionised titanium. T. DUNHAM, jun. (Nature, 1937, 139, 246—247).—The ultra-violet spectra of certain stars indicate the presence in interstellar space of ionised Ti with a mean life-time up to several weeks. L. S. T.

Spectrum of the twilight sky. V. TSCHERNIAEV and M. VUKS (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 77—79).—An intense emission at λ 5890 was observed in the spectra of the morning and evening twilight sky and night sky, attributed to H_2O vapour present at great heights. Owing to low dispersion in the green of the spectrograph used, the identity of a faint emission at λ 5610 in the twilight with the line λ 5577 in the night sky could not be established. R. C. M.

Sources of asymmetry in X-ray diffraction grating and refraction measurements. R. C. SPENCER (Physical Rev., 1935, [ii], 48, 478). L. S. T.

Effect of chemical combination on X-ray emission spectra. J. VALASEK (Physical Rev.,

1935, [ii], 48, 473).—An extension of previous work (A., 1935, 1046) to Na_2S , CdS , and AgCl . L. S. T.

K Absorption spectra of nickel. II. T. HAYASI (Sci. Rep. Tohoku, 1936, 25, 606—620; cf. A., 1936, 1169).—The absorption edges of Ni in NiCO_3 and Ni(OH)_2 show only one step, corresponding approx. with the short-wave K_2 edge of pure Ni, whilst those of NiAl and NiSn , which also show only one step, correspond with the K_1 edge of pure Ni. Ni_2O_3 shows two absorption edges, one corresponding with the K_2 edge of Ni. The fine structures of the immediate vicinity of the edges differ for the different compounds, indicating differences in energy vals. of the outer electrons. The K_1 absorption edge of Ni is associated with the $K\beta_5$ absorption line, indicating the existence of the quadrupole selection law in absorption processes. J. W. S.

Extra lines of the K spectra of nickel and copper. T. HAYASI (Sci. Rep. Tohoku, 1936, 25, 785—803). H. J. E.

X-Ray K absorption spectrum of copper. T. HAYASI (Sci. Rep. Tohoku, 1936, 25, 661—685).—Measurements with Cu, Cu-Ni, α - and β -brass, CuCO_3 , CuO , Cu_2O , and $\text{CuSO}_4\cdot\text{NH}_3$ are recorded, variations in the fine structure being discussed. H. J. E.

Magnitude of the K absorption discontinuity for tin and for silver. E. L. HARRINGTON and G. A. WIENSHALL (Physical Rev., 1935, [ii], 48, 477). L. S. T.

Auger effect for the L level of xenon and krypton. J. C. BOWER (Proc. Roy. Soc., 1936, A, 157, 662—667).—A study has been made of the efficiency of emission of L series fluorescence radiation from Xe and Kr, using an expansion chamber. The efficiency is about 20% for Xe and 8% for Kr. L. L. B.

L Spectra of iron above the Curie point. S. S. SUDHU (Indian J. Physics, 1936, 10, 421—428; cf. Hamer and Sidhu, A., 1928, 1298).—Vals. of the crit. potentials of Fe between 7.15 and 125.8 volts determined at 825° agree within experimental error with those measured by Thomas below the Curie point of Fe (A., 1926, 104). O. D. S.

L Absorption spectrum and characteristic levels of mercury. (MLLE.) Y. CAUCHOIS (Compt. rend., 1937, 204, 122—125; cf. A., 1935, 676, 800).—Data are given for red HgO , HgCl_2 , and Hg. Characteristic frequencies of Hg are calc. A. J. E. W.

Weak emissions in the L spectrum of rhenium (75). (MLLE.) Y. CAUCHOIS (Compt. rend., 1937, 204, 255—257; cf. A., 1936, 1169).— $\lambda\lambda$ of 21 lines are recorded and classified. A. J. E. W.

Cathode sputtering in arc discharges. L. R. KOLLER (Physics, 1936, 7, 225—231).—In the positive column the no. of Th atoms per positive ion sputtered from a thoriated W filament in Hg vapour increases with rise of the filament temp. and with decrease of arc current. The threshold is approx. 35 volts. In the cathode discharge, the relative effectiveness of the ions is $\text{Ne} > \text{A} > \text{Hg}$. The threshold for sputtering Ba from a cold oxide-coated filament in Ne is approx. 45 volts, and that for Ba from

a hot W filament is <14 volts in A and <15 volts in Ne. J. G. A. G.

The electron: its intellectual and social significance. K. T. COMPTON (Nature, 1937, 139, 229—240, and Science, 1937, 85, 27—37).—An address. L. S. T.

Energy states of valency electrons in some metals. I (3). The stationary states of valency electrons in zinc crystal. M. SATO (Sci. Rep. Tohoku, 1936, 25, 771—779; cf. A., 1936, 1316). H. J. E.

Dissociation of NO and HCl by electron impact. E. E. HANSON (Physical Rev., 1935, [ii], 48, 476).—Kinetic energies and heats of dissociation of the various processes are summarised. L. S. T.

Absorption of electrons [in lead]. S. H. NEDDERMEYER and C. D. ANDERSON (Physical Rev., 1935, [ii], 48, 486). L. S. T.

Motions of electrons in gases in electric and magnetic fields. L. G. H. HUXLEY (Phil. Mag., 1937, [viii], 23, 210—230).—Theoretical. A new method shows that the val. of g in the equation $w = g(Xe/m)(t/U)$ for the mean velocity of drift, w , of a group of electrons in the direction of electric force, X , is 0.667 instead of 1. Revised formulæ are derived for the velocity of drift when both electric and magnetic fields are applied. A. J. M.

Theory of motion of electrons in crossed electric and magnetic fields with space charge. S. V. BELLUSTIN (Physikal. Z. Sovietunion, 1936, 10, 251—256).—The work of Braude (A., 1935, 1294; cf. A., 1936, 540) is criticised on the ground that the conclusions are contained in the assumptions. The case when the magnetic field is $>$ a crit. val. and the electrons do not reach the anode is considered. A. J. M.

Motion of electrons in crossed electric and magnetic fields with space charge. S. J. BRAUDE (Physikal. Z. Sovietunion, 1936, 10, 429—430; cf. A., 1935, 1294).—A reply to Bellustin (preceding abstract). O. D. S.

Velocity distribution of electrons in a high vacuum under the influence of a magnetic field. I. M. VIGDORTSCHIK (Physikal. Z. Sovietunion, 1936, 10, 245—250).—The effect of a magnetic field of strength $>$ a crit. val. on an electrode in the region of, or between, the anode-cathode system is to cause a stream of electrons to flow to this electrode, especially if it has a negative potential with respect to the cathode. A. J. M.

Passage of heavy and light hydrogen ions through argon. F. WOLF (Ann. Physik, 1937, [v], 28, 361—374; cf. this vol., 3).—The variation with velocity of the charge transference cross-section, I , and of effective cross-section was determined from 30 to 1200 volts for $\text{D}^+ \rightarrow \text{A}$ and for $\text{D}_2^+ \rightarrow \text{A}$. The curve of I against linear ion velocity for D^+ is identical with that for H^+ at high velocities. The max. val. of I at low velocity for D^- is $>$ for H^+ , but occurs at the same velocity. The differences between the D^- and H^+ curves can be explained by the theory of Massey and Smith (A., 1933, 1223). The effective

cross-section of $D^+ \rightarrow A$ is equal to I at high velocities. O. D. S.

Dependence of mobility of ions in pure gases on temperature. L. G. H. HUXLEY (Phil. Mag., 1937, [vii], 23, 208—210).—The variation of mobility (k_p) of ions in pure gases with abs. temp. (T) is represented with considerable accuracy by the formula $k_p = AT^3/(C + T)$, due to Sutherland (A and C const.). The formula is tested with the experimental data of Tyndall *et al.* (A., 1935, 909) for N ions in N_2 , Cs ions in He, and Na ions in He. A. J. M.

Scattering of potassium ions by mercury vapour. A. G. ROUSE (Physical Rev., 1935, [ii], 48, 476).—With K^+ ions with energies between 20 and 300 e.v. scattering in the forward direction predominates. L. S. T.

Scattering of high-energy protons by oxygen nuclei. M. G. WHITE (Physical Rev., 1935, [ii], 48, 481).—Rutherford scattering is probably quite adequate to explain the results obtained with protons of 800 to >1000 kv. energy. Scattering decreases rapidly with an increase in the angle of scattering and increasing energy of the incident proton. L. S. T.

Energy of formation of negative ions in oxygen. L. B. LOEB (Physical Rev., 1935, [ii], 48, 484).—This energy lies between 0.06 and 0.34 volt, the higher val. being the more probable. L. S. T.

Absorption of positive rays. A. ROSTAGNI (Ric. sci. Prog. tec., 1935, [iii], 6, 185—186; Chem. Zentr., 1936, i, 1800).—The higher vals. for the effective area in the neutralisation of He^+ found by Wolf (A., 1935, 1048) are attributed to experimental error. J. S. A.

Seventh report of the At. Wt. Commission of the International Union for Chemistry. G. P. BAXTER, O. HONIGSCHMID, and P. LEBEAU (Ber., 1937, 70, [A], 43—56).—The report covers the period 30.9.35 to 30.9.36. The following changes are recommended: C, 12.00 to 12.01; Rb, 85.44 to 85.48; Gd, 157.3 to 156.9; Pb, 207.22 to 207.21; U, 238.14 to 238.07. H. W.

At. wt. of aluminium. J. I. HOFFMANN and G. E. F. LUNDELL (J. Res. Nat. Bur. Stand., 1937, 8, 1—18).—The at. wt. of Al, determined by converting the metal into $Al(OH)_3$ or $Al_2(SO_4)_3$ and heating to yield Al_2O_3 , which was ignited at 1200—1300°, is 26.974 ± 0.002 . J. W. S.

Radioactive isotope of potassium. W. R. SMYTHE and A. HEMMENDINGER (Physical Rev., 1937, [ii], 51, 178—182).— ^{39}K , ^{40}K , and ^{41}K have been separated by means of a high-intensity mass spectrometer, and activity measurements show that only ^{40}K is radioactive. Comparison of the β -ray emission from the isotopic samples and from KCl shows that ^{40}K is responsible for both of the known β -ray bands. N. M. B.

Loss of energy by α -particles in hydrogen. K. C. KAR and K. K. MUKHERJEE (Phil. Mag., 1937, [vii], 23, 230—239).—Mathematical. Expressions are derived for the loss of energy by α -particles on coming into the field of a normal H atom, such energy being used for excitation and ionisation. A. J. M.

α -[Ray] magnetic spectra in the actinium series. S. ROSENBLUM, M. GUILLLOT, and (MLLE.) M. PEREY (Compt. rend., 1937, 204, 175—177; cf. A., 1936, 657).—Data for $RdAc$ and $Ac-X$, obtained by an improved method, are recorded and discussed. A. J. E. W.

Determination of velocities of α -particles from their range, and the relation to the number of ion-pairs produced. S. MEYER (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 317—330; Chem. Zentr., 1936, i, 1798—1799).—The Geiger formula is applicable to rays with ranges from 3 to 11 cm. The initial energy required to leave the atom is about 50,000 e.v. The relation between the ranges and the no. of ion-pairs, n , can be applied only roughly to a restricted range, due to deviations from the Geiger formula and to the rise of the ratio n :energy of particle with increasing velocity. J. S. A.

Mass spectrum of positive rays from radium- C' . L. WISSGOTT (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 227—241; Chem. Zentr., 1936, i, 1798).—The long-range radiation from $Ra-C'$ is identified as α -particles from its e/m val. = $1/2$. Comparison with the spectrum of the 6.96-cm. rays from $Ra-C'$ shows the proportion of 9-cm. rays to be 25 per million. Natural H -rays have been recorded photographically. J. S. A.

Number of α -particles emitted from uranium. R. SCHIEDT (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 191—211; Chem. Zentr., 1936, i, 1798).—The emission from U_3O_8 is $1.258\text{—}1.270 \times 10^4$ α -particles per sec. per g. of U. J. S. A.

Counting of α -particles from uranium. F. HECHT (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 213—215; Chem. Zentr., 1936, i, 1798).—The microchemical determination of the wt. of U involved in Schiedt's experiments (cf. preceding abstract) is discussed. J. S. A.

Relation between the half-lifetimes and the at. wts. of the β -ray emitters. H. H. GOLDSMITH (Physical Rev., 1935, [ii], 48, 478).—Analysis of recent data reveals several regularities connecting half-life, at. no., and at. wt. of nuclei. L. S. T.

Equidistant energy levels in the nuclei of radioactive bodies. S. ROSENBLUM and M. GUILLLOT (Compt. rend., 1937, 204, 345—346; see above).—Regularities in e.v. multiples similar to those found for α -transformations are reported for β -transformations of $Th-C$ and $Th-C''$. N. M. B.

Secondary radiation from the β -rays of radium- E . G. F. VON DROSTE (Z. Physik, 1937, 104, 335—356).—Absorption curves in Pb of the secondary radiation produced by β -rays from $Ra-E$ in elements of different at. no. were obtained with a Geiger-Müller counter. The spectrum of the secondary radiation appears to be independent of the nuclear charge of the scattering element and is similar to that of the γ -radiation of $Ra-E$, which is regarded as an internal secondary radiation produced by the β -rays. Results are compared with the calculations of Bethe and Heitler. H. C. G.

Inner absorption of γ -rays in the L shell. E. STAHEL (Helv. phys. Acta, 1935, 8, 651—664;

Chem. Zentr., 1936, i, 1799).—The inner absorption coeff. for the γ -radiation of Ra-D is calc. from the no. of excited L shells, as calc. from the emission of L quanta and the known fluorescence yield for L radiation. The absorption coeff. found (17.1) differs entirely from those calc. for dipole (1.8) or quadrupole (2.9) radiation. J. S. A.

Emission of neutrons by minerals. P. DE LA CIERVA (Anal. Fís. Quím., 1936, 34, 766—769).—Spontaneous emission of neutrons could not be observed with beryl, albite, gadolinite, hambergite, chrysoberyl, cyrtolite, or Canadian pitchblende.

Back-scattering of neutrons and the production of spaces with high neutron concentration. H. R. VON TRAUBENBERG and H. ADAM (Z. Physik, 1937, 104, 442—447; cf. this vol., 58).—The possibility of preparing an enclosed space containing neutrons free from other disturbing matter is indicated. H. C. G.

Energy and intensity of the groups of neutrons emitted from Po + Be. I, II. G. BERNARDINI and D. BOCCIARELLI (Atti R. Accad. Lincei, 1936, [vi], 24, 59—64, 132—138).—I. The emission of two groups of neutrons from Po + Be with max. energies of 4 and 7.5—8 e.v. has been confirmed. The emission of a third group with max. energy of 6.5 e.v. seems probable.

II. Further evidence is given that three groups of neutrons are emitted by Po + Be. O. J. W.

Absorption of slow neutrons. E. AMALDI and E. FERMI (Ric. sci. Prog. tec., 1935, [ii], 6, 344—347; Chem. Zentr., 1936, i, 2030—2031).—The selective absorption effect is confirmed for B, Ce, Mn, Br, Rh, Ag, Ir, I, and Hg, using neutrons from Mn, Rh, Br, Ag, In, I, and Ir. J. S. A.

Absorption of slow neutrons. B. PONTECORVO (Ric. sci. Prog. tec., 1935, [ii], 6, 145—148; Chem. Zentr., 1936, i, 1795—1796).—Measurements on Li, B, Cl, Rh, Ag, and Cd show that each nuclear type absorbs neutrons of certain velocities preferentially, giving "neutron absorption bands." Neutron absorption in Gd is accompanied by emission of γ -rays: the collision area of the Gd nucleus is 3000×10^{-24} sq. cm. J. S. A.

Capture of slow neutrons in hydrogenous substances. W. E. LAMB, jun. (Physical Rev., 1937, [ii], 51, 187—190).—Mathematical. A study of the effect of the chemical binding of the proton in hydrogenous substances on the capture of slow neutrons shows that, in contrast with scattering cross-section, no change is made by this in the radiative capture cross-section. N. M. B.

Resonance levels of neutrons in silver nuclei. C. Y. CHAO and C. Y. FU (Chinese J. Physics, 1936, 2, 135—144; cf. A., 1936, 1173).—Using a thinner Ag scatterer to avoid multiple scattering, the β -activity induced in Ag by absorption of resonance neutrons and the apparent absorption coeff. of the neutrons are measured. Taking into account the variation of the capture cross-section within the absorption region, the total effective width of the resonance levels is calc. For the range 1.0—0.10 for one half of the half-val.

width, the average spacing between adjacent levels is of the order 800—80 volts, in good agreement with Bethe's theoretical estimate (cf. A., 1936, 1175).

N. M. B.

Scattering of slow neutrons by heavy atoms. J. H. VAN VLECK (Physical Rev., 1935, [ii], 48, 475).

L. S. T.

Radioactivity induced in lithium by neutrons. J. VELDKAMP and K. S. KNOL (Physica, 1937, 4, 166—170; cf. A., 1936, 542).—Saturated aq. LiNO_3 was circulated and bombarded with slow neutrons. The radioactive material produced has a half-life of 0.8 ± 0.2 sec. H. J. E.

Experiments on lithium, boron, and deuterium. K. D. ALEXOPOULOS (Helv. phys. Acta, 1935, 8, 601—636; Chem. Zentr., 1936, i, 1797; cf. A., 1936, 6).—By the bombardment of Li with 140-kv. protons, α -rays are produced. The yield of γ -rays, q , in the process is <1 quantum per two disintegrations. With deuterium bombardment, q is <1 in 8. For B, q is $< \frac{1}{2}$. J. S. A.

Attempt to detect radioactivity produced by positrons. G. P. THOMSON and J. A. SAXTON (Phil. Mag., 1937, [vii], 23, 241—246).—Borax, B_2O_3 , Be, MgO, LiF, graphite, and NaF were bombarded by positrons produced in Pb by materialisation of hard γ -rays from RaTh. No induced radioactivity was observed, a result to be expected on the neutrino hypothesis. Some abnormalities in the working of certain counters are noted. A. J. M.

Angular distribution of the transmuted nuclei in transmutation of light nuclei by hydrogen positive rays. I. H. NEUERT (Physikal. Z., 1937, 38, 122—126).—The distribution in a plane through the positive rays was determined. In the nuclear reaction ${}^2\text{D} + {}^2\text{D} \rightarrow {}^3\text{H} + {}^3\text{H}$, the transmuted particles were 1.6 times more frequent in and opposite to the direction of the positive rays than in a direction perpendicular to this. In the process ${}^3\text{Li} + {}^2\text{D} \rightarrow {}^4\text{Li} + {}^3\text{H}$, no dependence of the efficiency on the direction of the transmuted nuclei was found over the angular range 40° — 140° . The frequency in the case of ${}^{10}\text{B} + {}^1\text{H} \rightarrow {}^8\text{Be} + {}^2\text{He}$ shows a min. at 90° , and at 30° is 1.8 times $>$ at 90° . A. J. M.

Short-lived β -radioactivity. H. R. CRANE, L. A. DELSASSO, W. A. FOWLER, and C. C. LAURITSEN (Physical Rev., 1935, [ii], 48, 484).—Bombardment of B and Li with deuterons gives ${}^{12}\text{B}$ and ${}^8\text{Li}$ with half-lives 0.02 ± 0.01 and 0.5 ± 0.1 sec., respectively. These disintegrations are probably accompanied by proton emission. L. S. T.

Nucleus ${}^8\text{Be}$. R. DE L. KRONIG (Physica, 1937, 4, 171—174).—A discussion of the properties of ${}^8\text{Be}$ on the basis of its containing two α -particles in the nucleus. H. J. E.

Nuclear γ -radiation of beryllium. F. KOCH and F. RIEDER (Sitzungsber. Akad. Wiss. Wien, 1935, [iia], 144, 331—337; Chem. Zentr., 1936, i, 2032).—Wilson chamber experiments in a magnetic field are described. Equipartition of energy occurs in the formation of electron-positron pairs, and the energy distribution of the electrons and positrons reveals 5 (possibly 8) γ -ray lines. J. S. A.

Transmutation of beryllium by γ -rays. V. I. MAMASACHLISOV (Physikal. Z. Sovietunion, 1936, 10, 214—218).—A formula is derived for the effective cross-section of the nuclear photo-effect in Be with respect to the energy of the incident γ -rays. There is satisfactory agreement with experiment. A. J. M.

Passage of fast neutrons through beryllium. L. I. RUSINOV (Physikal. Z. Sovietunion, 1936, 10, 219—222).—The artificial radioactivity induced in Ag by neutrons from a Be-Rn source placed within a Be cylinder is 10% > when the source is enclosed in a C cylinder. The effect is due to the disintegration of Be by neutrons, the effective cross-section of the process being approx. 10^{-25} sq. cm. A. J. M.

Disintegration of beryllium by protons. J. S. ALLEN (Physical Rev., 1937, [ii], 51, 182—186).—The yield curves for thick and thin Be targets and the ratio of the no. of α -particles and deuterons ejected from the targets have been determined for 45—125 kv. The ranges of both groups of particles were 7.1 mm. From the energy relations the mass of ^9Be was 8.0074. The experimental effective collision area was of the same magnitude as that predicted by Gamow's theory of the penetration of a potential barrier by protons of zero angular momentum. N. M. B.

Nuclear photo-effect in beryllium. L. I. RUSINOV and A. N. SAGAIKAK (Physikal. Z. Sovietunion, 1936, 10, 203—213).—A method of determining the no. of neutrons emitted from a neutron source (α -rays + Be, and γ -rays + Be) based on the determination of the artificial radioactivity induced in I, Ag, Rh, and Mn is described. The effective cross-sections for the transmutation of Be by γ -rays from Rn were calc. Two vals. for the effective cross-section for the Be photo-effect for γ -rays of different energies were also calc. The theory of the nuclear photo-effect in D derived by Bethe and Peierls (A., 1935, 279) is applied to Be, and there is satisfactory agreement between theory and experiment if the neutron in Be is in the p -level. A. J. M.

Radioactivity of oxygen, silicon, and phosphorus. H. W. NEWSON (Physical Rev., 1935, [ii], 48, 482; cf. A., 1936, 132).—After bombardment with 3.2-mv. deuterons Si and P become radioactive; half-life, 170 min. and 14.5 days, respectively. Reactions, confirmed by chemical analysis, are $^{30}\text{Si} + ^2\text{D} \rightarrow ^{31}\text{Si} + ^1\text{H}$ and $^{31}\text{P} + ^2\text{D} \rightarrow ^{32}\text{P} + ^1\text{H}$. The max. ranges in Al of the electrons from ^{31}Si and ^{32}P are 0.616 and 0.712 g. per sq. cm., respectively. L. S. T.

Radiations emitted from artificially produced radioactive substances. III. β -Ray spectrum of ^{32}P . H. C. PAXTON (Physical Rev., 1937, [ii], 51, 170—177; cf. A., 1936, 542).—The high-energy portion of the distribution of β -rays from ^{32}P , investigated by means of a H_2 -filled cloud chamber in a magnetic field, followed a Konopinski-Uhlenbeck distribution (cf. A., 1935, 1048) for approx. 5875—6950 H_ρ , after which there is a sharp deviation near the high energy limit. Regular distribution was found for the low-energy part of the spectrum

obtained from a very thin source at the centre of the expansion chamber. N. M. B.

Formation of radio-phosphorus (^{30}P). J. R. S. WARING and W. Y. CHANG (Proc. Roy. Soc., 1936, A, 157, 652—661).—The formation of ^{30}P from Al by bombardment with α -particles has been studied for different energies of α -particles and for both thin and thick targets. The observed resonance levels are compared with those found for proton emission. The experimental results are consistent with Bohr's theory of the formation of intermediate products (A., 1936, 403). L. L. B.

Artificial radioactivity produced by γ -rays. W. BOTHE and W. GENTNER (Naturwiss., 1937, 25, 90).— γ -Rays of 17 e.m.v. obtained from Li by bombardment with protons of energy >450 kv. were used to obtain radioactive substances from Cu, Br, and P by means of the nuclear photo-effect. ^{63}Cu gave ^{62}Cu of half-life 11 min. The substance obtained from Br had half-life 18 min., the same as that of ^{80}Br formed also by the taking up of slow neutrons by ordinary Br ($^{79}\text{Br} + ^1\text{H}$). P gives a weak radioactivity of half-life 2—3 min., probably due to ^{30}P . In each case the radioactivity may be assumed to be due to the splitting off of a neutron. For Cu and Br it was shown that the activity followed the resonance curve of the Li γ -radiation as the proton energy was raised. A. J. M.

Preparation of new isotopes by the nuclear photo-effect. W. BOTHE and W. GENTNER (Naturwiss., 1937, 25, 126; cf. preceding abstract).—Some previously unknown radioactive isotopes have been obtained by bombarding elements with Li γ -radiation. ^{78}Br , ^{106}Ag , and ^{120}Sb (?) have half-life periods 3.5 min., 24 min., and 13 min., respectively. A. J. M.

Radioactivity of cobalt, nickel, copper, and zinc induced by neutrons. F. A. HEYN (Physica, 1937, 4, 160—165; cf. this vol., 5).—Vals. are given for the periods of activities induced in Co, Ni, Cu, and Zn by neutrons of various velocities. The activity of Cu and Zn when irradiated by fast neutrons was shown chemically to be due to isotopes ^{63}Cu and ^{65}Zn , respectively, the formation of which entails the production of 2 neutrons. H. J. E.

Experimental test of the super-nova hypothesis. Intensity of cosmic rays in the earth's crust. J. CLAY, C. G. 'T HOOFT, L. J. L. DEY, and J. T. WIERSMA (Physica, 1937, 4, 121—137).—A group of very hard rays was detected. The decrease in magnitude of the Hoffmann bursts with increasing depth shows them to have a sp. ionisation about 1% of the ionisation of high-energy electrons. The burst-producing rays may be neutrons. Bursts and showers are essentially different. H. J. E.

Ionisation in gases by γ -rays and ultra-radiation. J. JULFS and V. MASUCH (Z. Physik, 1937, 104, 458—467).—The ionising power of radioactive γ -rays and ultraradiation in the inert gases, air, H_2 , O_2 , and CO_2 has been measured. Whilst the ionising power of the hard components of ultraradiation \propto gas density, that of radioactive radiation

increases more rapidly than proportionality to density requires.

L. G. G.

Continuous variation of the cosmic-ray intensity in the higher layers of the troposphere. S. ZIEMECKI and K. NARKIEWICZ-JODKO (Bull. Acad. Polonaise, 1936, A, 318—326).—A continuous increase with altitude in the ionisation due to cosmic rays was observed between 6650 and 10,000 m. during a balloon flight. This result is not in agreement with that of Suckstorff (A., 1931, 282). The increase is more rapid than that described by Kollhorster and the ionisation curve shows no sharp max. in the mass absorption coeff.

O. D. S.

Absorption of cosmic radiation in matter. A. W. NYE (J. Franklin Inst., 1937, 223, 173—178).—Absorption measurements made with triple-coincidence Geiger counters, near sea level, for cosmic radiation in H₂O, coal, CuSO₄, FeS, sand, and BaSO₄ show that the coeff. of absorption is not strictly \propto density, divergence being found for substances of higher at. no. The coeffs. per bound electron were const. Showers followed the direction of the primaries, with max. for increasing thickness of shower-producing matter at about 50—100 g. per sq. cm. of material.

N. M. B.

Passage of cosmic-ray particles through screens. J. CRUSSARD and L. LEPRINCE-RINGUET (Compt. rend., 1937, 204, 240—242).—The losses of energy of cosmic particles on passing through 1 cm. of Pb were measured, using the large Bellevue electromagnet. Electrons suffered greater losses than positrons.

A. J. E. W.

Angular distribution of hard corpuscular cosmic rays. P. AUGER, P. EHRENFEST, jun., A. FREON, and A. FOURNIER (Compt. rend., 1937, 204, 257—259).—The variation of the intensity of the rays with their angle with the vertical was studied. The results are discussed.

A. J. E. W.

Ionisation measurements on swarms produced in lead by cosmic radiation. B. ROSSI and R. BOLDRINI (Ric. sci. Prog. tec., 1935, [ii], 6, 327—338; Chem. Zentr., 1936, i, 2033).—The independent measurement of Hoffmann collisions and the accompanying swarms is described.

J. S. A.

Theory of the deuteron; proton-neutron interaction with an exponential course. T. KAHAN (Compt. rend., 1937, 204, 414—416).—Mathematical.

A. J. E. W.

Self-consistent field, with exchange, for Cu. D. R. HARTREE and W. HARTREE (Proc. Roy. Soc., 1936, A, 157, 590—502; cf. A., 1936, 1046).—Fock's equations for the self-consistent field, with exchange, for Cu⁺ have been solved. The work is complicated by the extreme sensitiveness of the (3*d*)¹⁰ group. As in Cl[−], the main features of the effect of the exchange terms are a considerable contraction of the outermost (*nl*) groups, and a comparatively small alteration of the other groups of the outer shell. The calc. diamagnetic susceptibility is in good agreement with experiment.

L. L. B.

Theoretical derivation of the Fermi constant. K. BECHERT (Naturwiss., 1937, 25, 73).—The universal const. *g* occurring in Fermi's theory of the spon-

taneous β -decomp. of a nucleus (A., 1934, 579) has been calc. to be 4.06, 3.54, and 3.6 (all $\times 10^{-50}$ erg cm.³, according to the different assumptions made. The last two are considered the most likely.

A. J. M.

Effect of nuclear motion in the Dirac equation. I. S. LOWEN (Physical Rev., 1937, [ii], 51, 190—194).—Mathematical. Relativistic corrections to the Dirac equation are derived. The result, for a 1*s* electron, agrees with that obtained from the Schrödinger treatment.

N. M. B.

Laws of distribution of velocities of particles undergoing emission and absorption in a radiation field. J. KISHEN (Indian J. Physics, 1936, 10, 413—419).—Theoretical. It is shown that the general distribution law of velocities of particles moving in a radiation field is a Fermi-Dirac law or a Bose-Einstein law according as the particles have antisymmetric or symmetric wave functions. The application of these theorems to metal physics is discussed.

O. D. S.

Relativistic interaction of two electrons in the self-consistent field method. (Miss) B. SWIRLES (Proc. Roy. Soc., 1936, A, 157, 680—696).—The interaction of the spins of the electrons and the effect of retardation are introduced into the relativistic self-consistent field method, which is then applied to the evaluation of the separations of the components of the 2³P term of He.

L. L. B.

Nuclear spins and magnetic moments in the Hartree model. M. E. ROSE and H. A. BETHE (Physical Rev., 1937, [ii], 51, 205—213).—From the data of Feenberg (cf. this vol., 109) for the wave function and term character of the ground state of light nuclei, nuclear spins and magnetic moments are calc. for 15 nuclei ⁶Li—¹⁵O.

N. M. B.

Magnetic moment of the neutron. J. G. HOFFMAN, M. S. LIVINGSTON, and H. A. BETHE (Physical Rev., 1937, [ii], 51, 214—215).—An attempt to observe the magnetic moment of the neutron through its selective scattering from magnetised Fe gave an effect 3.3 times the mean error, in agreement with that obtained from an evaluation of Bloch's theory (cf. A., 1936, 1173).

N. M. B.

Theory of light nuclei. H. DOLCH (Z. Physik, 1937, 104, 473).—A correction to previous work (A., 1936, 918).

H. C. G.

Production of electromagnetic waves by neutrinos. J. GÉHENIAU (Compt. rend., 1937, 204, 235—237; cf. this vol., 60).—Mathematical.

A. J. E. W.

Limiting electric charge of very fine particles. M. PAUTHENIER and C. MARTIN (Compt. rend., 1937, 204, 239—240).—Results for particles of diameter 2—20 μ are in agreement with theory.

A. J. E. W.

Photo-electric spectrophotometry. G. KORTUM (Angew. Chem., 1937, 50, 193—204).—A survey is given of the suitability of subjective, photographic, and photo-electric methods of measurement in various analytical and physicochemical processes, the order of accuracy required being correlated with the errors of each method. Particular attention is directed to

photo-electric methods, and precision instruments (direct-throw, compensation, and substitution) are described. Errors due to effect of spectral impurity of light source on the extinction coeff. are discussed and the suitability of different types of photo-cell (boundary-layer, Se, alkali, and vac.) is examined from the point of view of temp. coeff., fatigue, lag (light sources of alternating intensity), and variation in response due to inhomogeneity of the cathode surface. Precision methods for varying light intensity, and methods of amplification of the photo-electric current, are discussed critically. L. G. G.

Inner effect in the ultra-violet. P. TARTAKOVSKI (Bull. Acad. Sci. U.R.S.S., 1936, 611—618; cf. this vol., 114). O. D. S.

Intermolecular forces responsible for pressure broadening of band lines. W. W. WATSON (J. Physical Chem., 1937, 41, 61—65).—Besides the effects due to collision and van der Waals forces, the pressure broadening observed in the spectra of polar gases may be increased by dipolar forces. J. W. S.

Spectra of diatomic molecules. R. S. MULLIKEN (J. Physical Chem., 1937, 41, 5—45).—A comprehensive survey. J. W. S.

Spectra of diatomic molecules of elements of the fifth group. G. M. ALMY (J. Physical Chem., 1937, 41, 47—56).—The spectra of N_2 , P_2 , PN , AsN , As_2 , Sb_2 , and Bi_2 mols. are described and discussed. J. W. S.

Nomenclature and symbols for polyatomic molecules. R. S. MULLIKEN (J. Physical Chem., 1937, 41, 159—173).—Standardised nomenclature for describing the spectra and energy levels of polyat. mols. is suggested. J. W. S.

Comparison of some ultra-violet absorption spectra of polyatomic molecules with those of diatomic molecules. W. A. NOYES, jun. (J. Physical Chem., 1937, 41, 81—89).—Dissimilarities between the electron states of CO and of the CO $^+$ group are pointed out. The agreement between the frequencies does not prove that the types of linkage are identical. The frequencies of double and triple linkages between C, N, and O in other groups are compared with those for the corresponding diat. mols. Such groups show characteristic frequencies for upper electron states just as for the ground states observed in Raman and infra-red spectra. J. W. S.

Emission of ultra-violet rays during slow decomposition of azides. R. AUDUBERT and H. MURAOUR (Compt. rend., 1937, 204, 431—432; cf. A., 1933, 764; 1936, 407).—Radiation was detected with a CuI photon counter during thermal decomp. of azides of Na, K, Pb, and Ag (strong emission), and Ca and Ba (weak emission). A. J. E. W.

Decomposition of polyatomic molecules by Schumann radiation. G. G. NEUMIN and A. N. TERENIN (Bull. Acad. Sci. U.R.S.S., 1936, 529—558).—The fluorescence under the action of Schumann radiation of a no. of compounds in the vapour state has been investigated. I_2 emits the line 2062 Å. of at. I. $TiCl_3$ emits the spectrum of at. Ti . H_2O ,

$MeOH$, $EtOH$, HCO_2H , and $AcOH$ emit bands of the OH radical. $MeCN$ emits the CN bands. NH_3 and N_2H_4 emit the α -bands of NH_3 ; this emission is ascribed to an excited NH_2 radical. Band emissions in the visible were observed with CO and HCO_2H , the latter being ascribed to the HCO radical. The emission of the excited OH radical is quenched strongly by CO and H_2 . N_2 and A have little effect. The emission of the CN radical is quenched by N_2 , the quenching of the 0—0 band being > that of the band 1—1. The emission of the NH_2 radical is approx. equally quenched by N_2 , H_2 , and A. O. D. S.

Fourth positive group bands of the carbon monoxide molecule in the Schumann region. V. M. TSCHULANOVSKI and B. I. STEPANOV (Physikal. Z. Sovietunion, 1936, 10, 292—314; cf. Read, A., 1934, 1287).—Seven bands of the fourth positive group of CO have been measured and analysed. Rotational consts. of the CO mol. are determined. Perturbations were observed in all bands. O. D. S.

Red degraded bands of carbon monoxide in the neighbourhood of 2670—3310 Å. R. SCHMID and L. GERO (Naturwiss., 1937, 25, 90).—The strongest band of this type is at 2670 Å. A. J. M.

Intense emission photographs of the (Cameron) intercombination bands of carbon monoxide with high dispersion. R. SCHMID and L. GERO (Naturwiss., 1937, 25, 90).—The $\alpha'^{3\Pi}-x^1\Sigma$ inter-combination bands of CO were obtained with sufficient intensity to be photographed by passing the discharge between C electrodes in Ne. The 0—0, 0—1, 0—2, 1—3, 0—3, 1—4, 2—5, 3—6, 4—7, and 4—8 bands were identified, the first three being particularly strong. A. J. M.

Thermal equilibrium of the gas in the direct-current carbon arc. W. T. GRAY (Physical Rev., 1935, [ii], 48, 474).—The rotational temp. of (CN) $_2$ mols. has been determined. The relative intensities of the rotational lines show a Maxwell-Boltzmann distribution of rotational energies in the (0, 0) 3883 Å., and (0, 1) 4216 Å. CN bands. The temp. corresponding with this distribution is $5300 \pm 300^\circ$ abs. over the range 7 to 21 amp. L. S. T.

Optical excitation of HgH and CN bands. L. Ø. OLSEN (Physical Rev., 1935, [ii], 48, 476).—When irradiated by light from an $Hg + H_2$ or $Hg + He$ discharge, Hg vapour in presence of 0.01 mm. of H_2 and approx. 3 mm. of N_2 gives a weak excitation of $^2\Pi-^2\Sigma$ HgH bands. The HgH mol. in its normal state dissociates quickly and the bands are obtained only when the 6^3P states of Hg are excited. L. S. T.

So-called pressure effect in the spectra of hydrides. E. OLSSON (Z. Physik, 1937, 104, 402—406).—The spectra of AlH and CaH are discussed. A. E. M.

Isolated group of lines in the spectrum of CH and CD. E. FAGERHOLM (Naturwiss., 1937, 25, 106—107).—The isolated group of lines at 4324 Å. occurs in the spectrum of a Meker flame, but disappears in active N_2 mixed with C_2H_2 . That the group is, however, due to CH has been shown by comparing the spectra of CH and CD. There is a

displacement of the group from 4323 Å. for CH to 4319.7 Å. for CD, and there is also a difference in the character of the spectrum, the group for CH being composed of a few lines, whilst that for CD has a better developed band structure. A. J. M.

Band spectrum of cobalt hydride. A. HEIMER (Z. Physik, 1937, 104, 448—457).—The emission spectrum of Co in H_2 at 2300—2400° shows two groups of lines ascribed to CoH mols. The band at λ 4492 has P, Q, and R branches; that at λ 4203 is similar but much fainter. Full data for both bands are given and discussed in relation to their origin in the CoH mol. H. C. G.

Band spectrum of gallium oxide and isotope effect of gallium. M. K. SEN (Indian J. Physics, 1936, 10, 429—445; cf. Guernsey, A., 1934, 1055).—A no. of new bands have been measured in the spectrum of GaO. The vibrational analysis of Guernsey is confirmed and extended but the double heads observed by her are ascribed to the isotopic mols. ^{69}GaO and ^{71}GaO . The dissociation energies of the mol. in the upper and lower states are calc. to be 4.96 and 3.07 volts, respectively. O. D. S.

Further relationships between absorption spectra of rare-earth salts and crystal structure. F. H. SPEDDING (J. Chem. Physics, 1937, 5, 160).—In crystals of rare-earth salts of the type $R_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ and $\text{RCl}_3 \cdot 6\text{H}_2\text{O}$ the rare-earth atom is usually surrounded by an octahedral arrangement of O atoms although for larger atoms an extra H_2O mol. can enter the lattice. Crystal Stark splitting of the spectra agrees with theory (cf. this vol., 111). W. R. A.

Rare-earth spectra in solids. J. H. VAN VLECK (J. Physical Chem., 1937, 41, 67—80).—The sharp lines in the spectra of cryst. rare-earth salts are forbidden lines attributable to several effects, viz., quadrupole radiation, magnetic dipole radiation, and radiation created by cryst. fields. There is probably some interplay between vibration and electronic motion. J. W. S.

Ultra-violet absorption spectrum of diborane. E. BLUM and G. HERZBERG (J. Physical Chem., 1937, 41, 91—95).—The ultra-violet absorption spectrum of B_2H_6 has been investigated down to 1550 Å. Regions of continuous absorption exist, extending from 2200 and 1700 Å., respectively, towards shorter λ . These correspond with transitions to two different excited states, the possible electron configurations of which are discussed on the basis of Mulliken's theory. J. W. S.

Photo-dissociation of alkyl halides. II. P. K. SEN-GUPTA (J. Univ. Bombay, 1936, 5, Part II, 22—33).—The author's earlier determinations of the continuous absorption spectra of the halogeno-methanes (*ibid.*, 1933, 2, 115) are discussed and compared with those of other investigators. E. S. H.

Spectra of methyl cyanide and methyl isocyanide. R. M. BADGER and S. H. BAUER (J. Amer. Chem. Soc., 1937, 59, 303—305).—Analysis of the spectra shows that, although the C—N linking in MeNC approximates to a triple linking, it possesses an appreciable amount of double linking character.

This does not produce any deviation from linearity in the C—N—C group, and MeNC appears to possess a threefold axis of symmetry. Absorption spectra of MeNC in the liquid state, and of liquid and gaseous MeCN, have been photographed in the infra-red. E. S. H.

Spectral study of ketonic polyenes. Extinction curves of (I) dibenzylideneacetone, (II) benzylideneacetone, (III) benzylideneacetophenone, and their *para*-substituted derivatives. V. ALEXA (Bul. Soc. Chim. Romania, 1936, 18, 67—82, 83—92, 93—101; cf. A., 1931, 1351).—I. The extinction curves for dibenzylideneacetone (I) and 7 *p*-disubstituted derivatives have been measured in C_6H_{14} , decalin, and EtOH. The EtOH enhances absorption and causes deformation of the curves. It is unsuitable as a solvent for comparing different substituents. The displacement of the curves to greater λ by different groups shows the following order of polarities: $\text{Cl} < \text{Me} < \text{OMe} < \text{OH} < \text{NMe}_2$.

II. In accordance with the theory of shared resonators the extinction max. are displaced to smaller λ than for (I). The effects of substituents in the C_6H_6 nucleus are similar to those for derivatives of (I).

III. The extinction curves and the effects of substituents and solvent are similar to those for $\text{CHPh}:\text{CMe}_2$, but the absorption max. are displaced approx. 500 Å. towards greater λ . H. J. E.

Absorption spectra of aromatic esters. H. MOHLER and J. PÓLYA (Helv. Chim. Acta, 1937, 20, 96—100).—Data are recorded for benzyl hexoate and laurate, Et and lauryl benzoate, lauryl phenylacetate, and $\text{CH}_2\text{Ph}:\text{OBz}$. E. S. H.

Optical absorption of porphyrins. X. A. STERN and H. MOLVIG (Z. physikal. Chem., 1937, 178, 161—183; cf. A., 1936, 1444).—On hydrogenation of the vinyl group in position 2 of the chlorin system to give mesochlorins a new absorption band appears, which represents the red band in the spectrum of the corresponding porphyrin. From the similarity in structure of the spectra of the porphyrins and mesochlorins it is inferred that in the chlorin system the pyrrolenine and pyrroline nuclei are opposite to each other (positions I and III). A new interpretation of the absorption spectra of the chlorins and phorbins and the corresponding porphyrins is advanced. The absorption spectra of the chlorins and mesochlorins in HCl solution have four bands in the visible. The relation of these spectra to those for solutions in neutral media indicates that salt formation in the mesochlorins occurs at the two opposite N atoms in nuclei I and III. R. C.

Polymerisation and polymeric adsorption as the cause of new types of absorption bands of organic dyes. G. SCHEIBE, L. KANDLER, and H. ECKER (Naturwiss., 1937, 25, 75).—Dyes of the pinacvanol and ψ -isocyanine class show, in aq. solution, absorption bands which vary considerably in position and intensity with varying concn. Strong bands may completely disappear, and new ones may be formed. It is suggested that this behaviour is due to ionic dissociation of the dye followed by

polymerisation of the hydrocarbon residues. The polymerides are responsible for the change in the absorption spectrum. In aq. solution of 1:1'-diethyl-*p*-isocyanine chloride of sufficiently great concn. the polymerisation leads to the appearance of an extremely narrow but intense band at 5725 Å. Simultaneously an intense fluorescence occurs, giving a narrow line at about 5750 Å. The polymerisation theory is supported by the marked increase in viscosity of the solution in the concn. range in which the absorption band appears. The polymerisation is completely reversed by raising the temp. by 30°. Dilution also affects all these properties very considerably. In D₂O the position of the absorption band is the same. The absorption and fluorescence bands of the dye are slightly altered when the dye is adsorbed from aq. solution on glass, quartz, gypsum, and mica. No adsorption occurs on freshly split fluorspar or on polystyrene. A. J. M.

Absorption of ultraviolet light by organic substances. XLI. Gossypol. R. GRINBAUM and L. MARCHLEWSKI (Bull. Acad. Polonaise, 1936, A, 367—369; cf. Podolskaja, A., 1936, 912).—EtOH solutions of gossypol show absorption maxima at 2390 and 2780 Å., with an indication of a third max. at 2910 Å. O. D. S.

Absorption spectra of nitrocellulose. K. MASAKI (Bull. Chem. Soc. Japan, 1937, 12, 1—3).—Films of cellulose nitrate, approx. 0.01 mm. thick, were obtained by evaporating COMe₂ or Et₂O-EtOH solutions on a Hg surface. Two regions of absorption, viz., between 3300 and 2500 and below 2500 Å., were obtained and attributed to the NO₂ groups. C. R. H.

Two types of diamond. (Sir) R. ROBERTSON, J. J. FOX, and A. E. MARTIN (Proc. Roy. Soc., 1936, A, 157, 579—593).—The physical properties of diamonds of the two types previously described (A., 1934, 583) have been further studied. The finer structure of the infra-red absorption spectrum has been explored with the aid of a grating, and the photo-electric effect was determined at a lower temp. (20° abs.) than before. At this temp. no abrupt change in the effects observed at 113° abs. was found. A clear differentiation of the two types of diamond in either possessing or not possessing a band at 8 μ was also obtained in emission. Diamonds of each type have the same sp. heat (determined by the method of Nernst and Eucken) throughout the crit range at low temp. and also at higher temp. L. L. B.

Infra-red absorption by H₂S. A. D. SPRAGUE and H. H. NIELSEN (J. Chem. Physics, 1937, 5, 85—89).—From measurements of the band at 3.7 μ (ν_2) with a grating of 3600 lines per in. the evidence of Bailey, Thompson, and Hale that this band has a Q branch is disputed (cf. this vol., 9). The band is ascribed to an oscillation of the electric moment along the axis of intermediate moment of inertia. The band at 8.0 μ (ν_2) has a broad and partly resolved Q branch and arises from a vibration along the axis of least moment of inertia. The presence of a Q branch in ν_2 and the absence of one in ν_3 demand a model with an apical angle <88°. ν_1 is taken as 2615 cm.⁻¹ Other bands at 3970, 9911, and 10,100

cm.⁻¹ are combination tones. The moments of inertia are evaluated and agree with those of Cross; from these the apical angle is computed as 85° (cf. Cross 92°; Bailey *et al.*, 110°). W. R. A.

Spectrum of hydrogen sulphide in the photographic infra-red. F. D. CARVIN (J. Chem. Physics, 1937, 5, 159).—Photographs of the spectrum of a 60-ft. column of gas at 1.75 atm. were taken in the first order of a 21-ft. concave grating giving a dispersion of 2.6 Å. per mm. Measurements of 10 lines around 10,100 cm.⁻¹ and 17 around 9900 cm.⁻¹ are given. The band at 9900 cm.⁻¹ shows a pronounced min. in the centre and the vibration is therefore along the intermediate moment of inertia and must be parallel to the symmetry plane unless the apical angle is <88°, which is unlikely from chemical evidence. Evidence to warrant the classification of the band at 10,100 cm.⁻¹ is insufficient (cf. preceding abstract). W. R. A.

Infra-red absorption of heavy acid solutions. D. WILLIAMS and E. R. PLYLER (J. Amer. Chem. Soc., 1937, 59, 319—321).—Infra-red absorption of D₂O, DCl, D₂SO₄, and D₃PO₄ has been measured between 2 and 12 μ . The spectrum of D₂O contains bands at 2.9, 4.0, 6.8, 8.2, and 10.4 μ . The acid solutions show intense absorption bands at 3.4 μ and 5.5 μ in addition to the bands characteristic of the solvent; these are ascribed to hydration. Solutions of D₂SO₄ and D₃PO₄ also show characteristic SO₄ and PO₄ absorption, respectively. E. S. H.

Infra-red absorption spectra of photo-chemically sensitised alkali halide crystals. K. KORTN (Nachr. Ges. Wiss. Göttingen, Math.-physik. Kl., II, 1935, [iii], 1, 221—227; Chem. Zentr., 1936, i, 2038).—KBr crystals with U-centres showed no infra-red absorption, but KCl sensitised with KNO₃ showed bands at 7.15 and 7.18 μ , due to the incorporation of NO₃⁻ ions. The bands disappeared irreversibly after electron migration. Crystals sensitised with KCN similarly showed bands at 4.58, 7.70, and 8.22 μ , agreeing with the Raman spectrum of KCNO (formed in the fusion process). These bands disappear and are replaced by the CO₂⁻ band at 7.00 μ . It is concluded that K₂O is the photosensitive species. J. S. A.

Rotation-vibrations of polyatomic molecules in the photographic infra-red. H. VERLEGER (Physikal. Z., 1937, 38, 83—103).—A review dealing particularly with the analysis of the photographic infra-red rotation-vibration spectra of CO₂, HCN, C₂H₂, C₂HD, N₃H, MeCl, MeBr, MeI, MeOH, MeN₃, CH₃Me, CH₄, MeD, HCO₂H, NH₃, ND₃, H₂O, HDO, D₂O, and HNCO. A. J. M.

Photographic infra-red spectrum of methylacetylene (allylene) and the C-C single bond distance. G. HERZBERG, F. PATAT, and H. VERLEGER (J. Physical Chem., 1937, 41, 123—132).—A band at 10,304 Å. has been found in the absorption spectrum of CMe:CH, of simple type with P, Q, and R branches, the structure of which indicates that the C-C-CH group lies in a straight line. The moment of inertia of the mol. in its ground state is 97.15 × 10⁻⁴⁰ g. cm.² Assuming the other nuclear distances are

the same as in C_2H_2 and CH_4 , respectively, the C-C single linking distance is calc. as 1.462 ± 0.005 A.

J. W. S.

OH band of monomolecules of [ethyl] alcohol in the 3 μ region. J. ERRERA and P. MOLLET (Compt. rend., 1937, 204, 259—261; cf. this vol., 9).—The absorption band at 3 μ , which disappears on dilution, is attributed to linkings between O and H in separate mols. The bands is not given by MeOH vapour. A band at 2.73 μ is attributed to the single mols.

A. J. E. W.

Absorption spectra in the near infra-red of mixtures of amines and alcohols. Formation of ammonium compounds. (MME.) M. FREY-MANN (Compt. rend., 1937, 204, 261—263; cf. this vol., 131).—The OH absorption band in alcohols disappears or decreases in intensity on mixing with amines. The effect is probably due to the formation of singlet linkages between the hydroxylic H and the N in the amine.

A. J. E. W.

Absorption spectrum of amines in the very near infra-red (6000—9500 A.). P. BARCHEWITZ (Compt. rend., 1937, 204, 246—249).—Measurements on the third and fourth harmonics of the NH band system at 3 μ are recorded for 10 amines. The effect of the attached groups, and of using H_2O and CCl_4 as solvents, is discussed.

A. J. E. W.

Infra-red absorption spectrum and molecular structure of pyruvic acid. P. BAYARD (Compt. rend., 1937, 204, 177—179).— λ of 12 absorption bands in the range 0.8—2.5 μ are given. Bands attributed to both ketonic and enolic forms occur; the ketonic form predominates.

A. J. E. W.

Raman spectra and latent heat of fusion of non-associated substances. C. J. PHILLIPS (Indian J. Physics, 1936, 10, 447—456; cf. A., 1936, 1318).—Raman shifts ascribed to energy of fusion are calc. to lie between 350 and 1600 cm^{-1} .

O. D. S.

Critical opalescence of carbon dioxide. S. PARTHASARATHY (J. Univ. Bombay, 1936, 5, Part II, 34—40).—Determinations of the intensity and polarisation of scattered light in the crit. region are in accordance with the Einstein-Smoluchowski expression.

E. S. H.

Raman spectra of liquid Si_2Cl_6 and gaseous Si_2H_6 . F. STITT and D. M. YOST (J. Chem. Physics, 1937, 5, 90—96).—Raman frequencies of gaseous Si_2H_6 and liquid Si_2Cl_6 and depolarisation factors of Si_2Cl_6 are given. The relation among the modes of vibration of similar mols. having different symmetry is discussed. This and the known assignment of the fundamental frequencies of SiH_4 , $SiHCl_3$, and $SiCl_3Br$ lead to a definite assignment of the three observed lines of Si_2H_6 . A tentative assignment of the lines of Si_2Cl_6 is made; this mol. appears to possess internal rotation at room temp.

W. R. A.

Raman effect of deuteroammonia. G. GLOCKER and F. T. WALL (J. Physical Chem., 1937, 41, 143—147).— ND_3 shows a strong Raman frequency at 2420.0 cm^{-1} , in accord with its infra-red absorption spectrum. The assignment of type of vibration to vibration frequencies is discussed in detail.

J. W. S.

Effects of sulphuric acid and of zinc chloride on the main Raman band of water. P. A. LEIGHTON and J. BURNHAM (J. Amer. Chem. Soc., 1937, 59, 424—425).— H_2SO_4 and $ZnCl_2$ produce marked changes in the shape and frequency of the max. of the main band.

E. S. H.

Constitution of acids of elements of group V and their salts. I. H_3PO_4 , H_3PO_3 , H_3PO_2 , and their salts. A. SIMON and F. FEHÉR (Z. anorg. Chem., 1937, 230, 289—307).—All three acids, after careful purification, give Raman spectra in which neither the general character nor the no. of lines is changed by dilution or, in the case of H_3PO_4 and H_3PO_3 , by introduction of the max. no. of K or Na atoms. No OH band is detectable. A frequency about 2400 cm^{-1} is shown by H_3PO_3 and more strongly by H_3PO_2 and is attributed to a P-H vibration. The results point unambiguously to the formulæ $H_3[PO_4]$, $H_2[HPO_3]$, and $H[H_2PO_2]$ for the main constituents of the acids, although they do not exclude a small proportion of a tautomeric form.

F. L. U.

Raman spectra of crystal powders. I. Halides and sulphate of ammonium. II. Chlorides and sulphates of hydroxylamine and hydrazine. R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1937, 5, A, 76—86, 87—93; cf. A., 1936, 1445, 1480).—I. A new technique for photographing the complete Raman spectra of crystal powders and amorphous substances is described. Raman spectral data are tabulated and discussed for cryst. NH_4F , NH_4Cl , NH_4Br , NH_4I , and $(NH_4)_2SO_4$ at room temp. Spectra of NH_4^+ show marked dependence on cryst. structure of the salt and nature of the anion. Lines for NH_4Cl and NH_4Br are very intense and have their analogues in the infra-red absorption spectra, suggesting lack of tetrahedral symmetry for NH_4^+ . NH_4I and NH_4F show different and weaker spectra; the spectrum of NH_4^+ in $(NH_4)_2SO_4$ was extremely feeble.

II. Raman data for the cryst. sulphates and hydrochlorides of NH_2OH and N_2H_4 are tabulated and discussed with reference to ionic vibrations. The N-H bands of the hydrochlorides show multiplicity and diffuseness; in the sulphates they are much weaker and more diffuse. There is a lowering of the N-H frequencies in quinque- as opposed to ter-valent N derivatives, indicating a weakening of the N-H linking when the covalency of N changes from 3 to 4.

N. M. B.

Raman spectra of different modifications of crystals. S. C. SARKAR and J. GUPTA (Indian J. Physics, 1936, 10, 473—481; cf. Vuks, A., 1936, 547).—No abrupt change in the scattered spectra of $p\text{-C}_6\text{H}_4\text{Br}_2$ (I) and of S was observed on passing through the temp. of transition between two modifications, i.e., from 32° to -40° and from 85° to 105° , respectively. The spectrum of $p\text{-C}_6\text{H}_4\text{Cl}_2$ (II) was found to be the same at 32° and 45° but by precooling in ice the whole of the Raman spectrum at 32° was shifted. At -180° the lines of (I) and (II) were shifted away from the Rayleigh line. The linear coeff. of expansion calc. from the shift appears to be too high. The line 86 cm^{-1} of S is shifted to 84 cm^{-1} at -180° . The conclusions of Venkateswaran (this vol., 9) are criticised.

O. D. S.

Raman spectra of oxalates and oxalato complexes. Vibration of dicarboxyl. J. GUPTA (Indian J. Physics, 1936, 10, 465—472; cf. A., 1936, 922).—The Raman spectra of KHC_2O_4 , $\text{K}_2[\text{TiO}(\text{C}_2\text{O}_4)_2]$ (I), and $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$ (II) have been investigated. Differences from the spectra of normal oxalates in the spectrum of (II) indicate a change in the structure of the C_2O_4 group by co-ordination, but are less marked in the spectrum of (I). The identification of Raman frequencies of oxalates with modes of vibration of the C_2O_4 group is discussed. The possibility of a new type of *cis-trans* isomerism is suggested. O. D. S.

Raman spectra of stereoisomeric complexes of platinum and cobalt. P. SPACU (Bull. Soc. chim., 1937, [v], 4, 364—367).—Raman spectra have been determined for *cis*- and *trans*- $[\text{Pt}(\text{NH}_3)_2(\text{C}_5\text{H}_5\text{N})_2]\text{Cl}_2$, $[\text{Pt}(\text{C}_5\text{H}_5\text{N})_2]\text{Cl}_2$, $[\text{Co en}_2(\text{NO}_2)_2]\text{NO}_3$, and $[\text{Co en}_2(\text{SCN})_2]\text{SCN}$. The results are discussed in relation to the structure of the co-ordination linking and the position of radicals and neutral mols. with respect to the central atom. E. S. H.

Raman spectra of amino-acids and related compounds. II. Guanidine and urea derivatives. J. T. EDSALL (J. Physical Chem., 1937, 41, 133—141; cf. A., 1936, 269).—The Raman spectra of $\text{CS}(\text{NH}_2)_2$, $\text{CCl}(\text{NH}_2)_3$, $\text{CCl}(\text{NH}_2)_2\cdot\text{NHMe}$, $\text{NH}_2\cdot\text{CO}\cdot\text{NHMe}$, and $\text{CSMe}\cdot\text{NH}$, are very similar to that of $\text{CO}(\text{NH}_2)_2$. The spectrum of the $\text{C}(\text{NH}_2)_3^+$ ion indicates that it possesses trigonal symmetry like the CO_3^{2-} and NO_3^- ions, in accord with the theory of resonance and X-ray refraction data. $\text{CO}(\text{NH}_2)_2$ and $\text{CS}(\text{NH}_2)_2$ have only a twofold axis of symmetry. It is suggested that the HCO_2^+ ion should have a twofold axis of symmetry, and a tentative analysis of its Raman spectrum is suggested on this basis. J. W. S.

Raman spectrum of benzene vapour. S. BHAGAVANTAM and A. V. RAO (Proc. Indian Acad. Sci., 1937, 5, A, 18—22; cf. this vol., 113).—A detailed account of results previously reported. N. M. B.

Raman spectrum of thiophen. G. B. BONINO and R. MANZONI-ANSIDEI (Atti R. Accad. Lincei, 1936, [vi], 24, 207—212; cf. A., 1934, 830).—Previous results are confirmed and a few new weak lines observed. The Raman spectrum data are compared with infra-red data, and the symmetry type of $\text{C}_4\text{H}_4\text{S}$ is discussed. O. J. W.

Raman spectrum of camphor and camphor-aldehyde (hydroxymethylenecamphor). G. B. BONINO and R. MANZONI-ANSIDEI (Ric. sci. Prog. tec., 1935, 6, II, 181—182; Chem. Zentr., 1936, i, 1845).—Hydroxymethylenecamphor gives a diffuse line at 1640 cm^{-1} in addition to the CO line at 1734 cm^{-1} ; this is ascribed to wave-mechanical resonance between the aldehyde and hydroxymethylene structures. H. N. R.

Clustering in simple liquids. S. PARTHASARATHY (J. Univ. Bombay, 1936, 5, Part II, 16—21).—Scattering of incident horizontally polarised light has been observed in several org. liquids. In AcOH , MeOH , Pr^nOH , and $\text{C}_5\text{H}_{11}\cdot\text{OH}$ the ratio of the horizontal to the vertical component of the scattered

light is >1 . The result is ascribed to the existence of disc-like clusters in the liquids. E. S. H.

Mitogenetic secondary radiation. A. GURWITSCH and L. GURWITSCH (Protoplasma, 1936, 25, 1—15).—Such substances as glucose, protein, and nucleic acid give rise to secondary radiations when exposed to mitogenetic rays of similar spectrum to the radiations emitted by these substances during fermentative decomp. M. A. B.

Theory of phosphorescence. D. BLOCHINZEV (Physikal. Z. Sovietunion, 1936, 10, 424—426).—An extension of a previous paper (A., 1934, 716). O. D. S.

Luminescence and its applications. J. T. RANDALL (J. Soc. Arts, 1937, 85, 353—381).—A lecture.

Chemiluminescence with two organic reactions.—See A., II, 119.

Luminescence of solutions of terbium salts. A. SEIDEL (Nature, 1937, 139, 248—249).— $\lambda\lambda$ from 490 to $681\text{ m}\mu$ and intensities of the bands are tabulated. The bands have a well-defined structure depending on the nature of the anion. L. S. T.

Influence of electrolytes on the fluorescence of rhodamine solutions in methyl alcohol. A. V. BANOV and S. N. RABOTNOV (J. Phys. Chem. Russ., 1936, 8, 295—299).—LiCl displaces the bands of absorption and fluorescence of rhodamine B to longer λ . The extinction of the fluorescence by various concns. of LiCl and dye was examined; it is caused rather by increase of the activity of the dye than by collisions of the second kind (cf. A., 1933, 446). J. J. B.

"Concentration extinction" of fluorescence of dye solutions. F. DUSCHINSKI (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 73—76; cf. A., 1935, 1190; 1936, 548, 923).—Theoretical. Perrin's assumption (A., 1931, 998) of energy exchange by resonance between the components of a mol. pair (or higher complex) accounts for all the known phenomena and leads to an expression for the yield as a function of concn. in close agreement with Vavilov's figures for fluorescein in Pr^nOH . R. C. M.

Phosphorescent glass; influence of crystallisation. M. CURIE (Compt. rend., 1937, 204, 352—353).—Details are given of the fluorescence, phosphorescence, and thermoluminescence of specimens of glass and the effect, on duration and intensity, due to crystallisation induced by heating for long periods at 800 — 1200° . The specimens were ordinary glass and a Zn-B glass with the addition of, separately, 1% Mn, Pb, Bi, Sm, and U. Explanations are discussed. N. M. B.

Electrolytic valve action with liquid ammonia as solvent. A. GÜNTHER-SCHULZE and H. BE (Z. Physik, 1937, 104, 440—441).—Ta does not give an oxide layer with any electrolyte in liquid NH_3 . If previously "formed" in aq. solution, the current-voltage relationship in liquid NH_3 follows the equation $j = a \cdot v^{1.8}$ amp. per sq. cm. Al forms imperfectly in liquid NH_3 solutions of H_3BO_3 , borates, and ice, the oxide layer tending to flake off. Mg, Cu, and Fe will not form. L. G. G.

Shenstone effect. A. H. WEBER (J. Franklin Inst., 1937, 223, 215—242).—The variation of photo-electric sensitivity of a metal as a function of electric currents passed through it was investigated. A study of the effect of occluded gases on the total photo-electric emission of Mo and Bi for nil, partial, and thorough outgassing, and of temp. influence on the Shenstone effect, shows that the initial large increases in photo-electric emission with passage of currents is due to the removal of occluded gases, and that the observed sensitivity variations as a function of current are connected with a variation of the gas content superinduced by temp. change, and, for outgassed Mo, are attributed to the formation and evaporation of an adsorbed electropositive gas layer.

N. M. B.

Photo-electric emission. H. C. RENTSCHLER and D. E. HENRY (J. Franklin Inst., 1937, 223, 135—145).—Investigations of the reaction of Ti, Mo, W, Fe, Th, U, Ca, and Cs surfaces with O_2 show that the shift in sensitivity towards longer λ is due to a reaction and not to the physical nature of the surface. The similar shift when an alkali metal deposits on another metal is explained in the same way.

N. M. B.

Dyes of the anthracene group and their photo-sensitive capacity. (MILLER.) H. T. NGA (Compt. rend., 1937, 204, 429—430).—Among eight derivatives of anthraquinone examined, only those containing N gave measurable photo-potentials.

A. J. E. W.

Electron theory of metals. II. S. SCHUBIN and S. VONSOVSKI (Physikal. Z. Sovietunion, 1936, 10, 348—377; cf. A., 1935, 1298).—Mathematical.

O. D. S.

Influence of a concentrated space charge on the electrical insulation of calcite. A. VENDEROVITSCH and A. VOROBYOV (Physikal. Z. Sovietunion, 1936, 10, 413—420).—The discharge potential of calcite in a homogenous field is decreased by preliminary polarisation of the crystal when the discharge occurs in the direction of the polarisation and is increased when the directions of polarisation and discharge are opposite. The results are best explained by Fowler's theory (cf. A., 1933, 887).

O. D. S.

Electrical conductivity of real dielectrics at high field strengths. F. QUITTNER (Bull. Acad. Sci. U.R.S.S., 1936, 600—610).—The conductivity of mica perpendicular to the cleavage faces is purely electronic at high field strengths and temp. about 60° . At temp. $>250^\circ$ the conductivity is electrolytic. The conductivity parallel to the cleavage faces due to impurities is electrolytic. The conductivity of quartz cut parallel to the optic axis is electronic at 250° . The Faraday laws are not obeyed by natural rock-salt at 150° , and 100 kv. per cm., indicating that under these conditions the crystal is a mixed conductor.

O. D. S.

Conductivity of solid insulators in strong electric fields. A. F. WALTHER and L. D. INGE (Bull. Acad. Sci. U.R.S.S., 1936, 561—578).—The conductivity, γ , of rock-salt (I) and of glass was measured up to 10^6 volts per cm. and 2×10^6 volts per cm., respectively. Between 0° and 160° γ of (I)

increases with field strength and varies with temp. according to $\gamma = Ae^{-b/T}$. For field strengths up to 5×10^5 volts per cm. b is 9500—10,000; at higher field strengths b decreases to approx. 7500 at 10^6 volts per cm. Crystals annealed at 700° show a less sharp rise in γ with field strength and have higher initial conductivity. γ of glass increases less rapidly with field strength than that of (I). The relation $\gamma = Ae^{-b/T}$ is approx. obeyed and the curves of γ against T for all field strengths are parallel.

O. D. S.

Dipole moment, configuration, and reactivity of aromatic nitro-derivatives.—See A., II, 140.

Dipole moment and structure of tellurium dimethyl di-iodide. C. YAO and C. E. SUN (J. Chinese Chem. Soc., 1937, 5, 22—24).—The dipole moment of the "trans" form of $TeMe_2I_2$ at 25° is 2.26×10^{-18} e.s.u. from measurements of C_6H_6 solutions. The presence of a moment eliminates a planar structure, in agreement with Drew's result (A., 1929, 546).

R. S. B.

Dielectric polarisation of chloronitrobenzene in liquid state. A. JAGIELSKI (Bull. Acad. Polonaise, 1936, A, 451—456).—The dielectric polarisation P of *o*- and *m*- $C_6H_4ClNO_2$ between 40° and 170° is practically independent of temp. From the temp. variation of P for *p*- $C_6H_4ClNO_2$, the dipole moment (0.92×10^{-18} e.s.u.) is \ll is found in solution.

J. S. A.

Mechanism of current conduction in liquids of low dielectric constant. K. H. REISS (Ann. Physik, 1937, [v], 28, 325—352; cf. Nikuradse, A., 1932, 983).—The photoconductivity of a solution of anthracene in C_6H_{14} (10^{-4} g. mol. per litre) varies with the distance between the electrodes while the dark current remains const. The mobilities of the carriers of the current are U_o 9.9×10^{-4} , U_a 1.3×10^{-3} cm.² per volt per sec. U_a is strongly decreased by impurities, especially unsaturated mols. It is deduced that U_a corresponds with the mobility of electrons which enter into temporary combination with mols. of the solution or impurities. Up to 300 kv. per cm. the photo-electric current does not increase with potential. From measurements at 400 kv. per cm. it is calc. that the max. ionisation produced by collision is 20 new ions per negative ion. Illumination of the cathode causes a small increase in the conductivity of Et_2O . The effect does not increase with voltage in the same degree as the dark current. The variation with potential of the conductivity of C_6H_{14} , PhMe, Et_2O , and PhCl is interpreted on the theory of Onsager (A., 1935, 1176).

O. D. S.

Optical rotation and refractivity of nicotine and nicotine sulphate in dilute aqueous solution. F. G. H. TATE and L. A. WARREN (J.S.C.I., 1937, 56, 39—40T).—Pure nicotine (I) has d_{40}^{20} 1.0096, $[\alpha]_D^{20}$ -169.4° , $[\alpha]_{2401}^{20}$ -204.1° . In 0—10% aq. solutions pure (I) and nicotine sulphate (II) have $[\alpha]_D^{20}$ -79.4° , $[\alpha]_{2401}^{20}$ -96.1° and $[\alpha]_D^{20}$ $+14.3^\circ$, $[\alpha]_{2401}^{20}$ $+17.2^\circ$, respectively. The rotations of mean yellow light are stated in sugar (Ventzke) degrees. The Zeiss immersion refractometer readings of (I) and (II) solutions become higher as the concn. is raised. From 0 to 10% the increase in reading \propto increase in concn.,

the increment for (I) solutions being 5.41 units, and for (II) solutions 5.13 units, per 1% increase.

Rotatory dispersion. XXX. **Campholic aldehyde.** T. M. LOWRY and W. C. G. BALDWIN (J.C.S., 1937, 233—236; cf. A., 1936, 1184).—The rotatory dispersion of campholic aldehyde, measured in cyclohexane and in CHCl_3 , is unusually complex. The difference curve is of the same sign as the $\cdot\text{CHO}$ contribution. The circular dichroism is a max. at 2995 Å. and has at least two components. The main rotation is divided into three parts associated with the $\cdot\text{CHO}$ and the two asymmetric C groupings.

F. L. U.

Relations between optical rotatory power and constitution in the steroids.—Sec A., II, 147.

Complex salts of racemic and optically active 1:2-diaminocyclohexanes with tervalent cobalt and rhodium. I. *trans*-1:2-Diaminocyclohexane and its fission into optically active antipodes. F. M. JAEGER and L. BIJCKER (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 12—23).—*trans*-1:2-Diaminocyclohexane (A., 1936, 717) has been resolved by means of the neutral *d*-tartrates. Crystallographic data are given for the *i*-, *d*-, and *l*-hydrochlorides and -nitrates. The rotatory dispersion of the molten *l*-base has been measured at 55° in the range λ 6480—4950 Å. Crystallographic measurements are given for cyclohexane-1:2-dione dioxime and bistetramethylenepiperazine hydrochloride.

F. L. U.

Relative and absolute spatial configuration of isomorphous optically active complex salts of tervalent cobalt and rhodium. I. Comparison of triethylenediamine and tricyclohexanediamine salts. F. M. JAEGER (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 2—11; cf. A., 1928, 1172).—The validity of Werner's solubility rule is demonstrated in the case of the triethylenediamine (ene) and and tricyclohexanediamine (ex) salts of Co and Rh. $L\text{-}[\text{Co}(d\text{-ex})_3]\text{Cl}_3$ (*L* denotes rotation of resolved complex ion in red light) forms an apparent exception, caused by the superimposed action of the active base present in the complex. Salts isolated from the least sol. chloro- or bromo-*d*-tartrates all possess the spatial configuration characteristic of the *d*-ene ion. Substitution of Rh for Co causes inversion of the sign of rotation when the ions in which the substitution occurs have the same abs. spatial configuration. F. L. U.

Magnetic birefringence of solutions of rare-earth salts. C. HAENNY (Ann. Physique, 1937, [xi], 7, 230—290).—Data are tabulated and plotted for measurements of birefringence over a range of concns. of aq. solutions of the nitrate, chloride, perchlorate, and acetate, and alcoholic solutions of the nitrates for the rare-earth elements, of the comparative effect in a no. of Ce salts, and for the abs. magnetisation coeffs. in the temp. range 20—70°, from which magnetic moments are calc. The birefringence is interpreted in conjunction with data for n and solution density. Results are in agreement with the known magnetic properties of the rare earths and the magnetic rotatory power of the solutions, with the Langevin theory of birefringence of paramagnetic

liquids, and with the temp. variation relation deduced from the Curie-Weiss law. N. M. B.

Molecular structure of quinhydrone. J. PALACIOS and O. R. FOZ (Anal. Fis. Quím., 1936, 34, 779—781; cf. A., 1936, 784).—The subperiodicity previously observed is attributed to the difference in the size of the benzoquinone and benzene rings observed by Robertson (A., 1935, 921). F. R. G.

Nature of the hydrogen bond. II. Role of resonance. General considerations. A. SHERMAN (J. Physical Chem., 1937, 41, 117—122; cf. A., 1936, 1051).—Abnormalities in physical properties and the absence of characteristic OH absorption bands in the infra-red are not satisfactory criteria of the presence of H-bonds in mols., since they are not always consistent with thermochemical data. A H-bond is defined as one the energy of which is derived from the resonant energy of quantum mechanics, the electron of a H atom being part of the resonating system. Experimental tests for the presence of such a bond must involve determination of the heat of combustion or formation and comparison of this val. with that expected for the mol. without the bond. J. W. S.

Kinetic equation for the case of Coulomb interaction. L. LANDAU (Physikal. Z. Sovietunion, 1936, 10, 154—164).—Mathematical. The kinetic theory is applied to a system of charged particles, taking the Coulomb interaction into account.

A. J. M.

Crossing of potential surfaces. E. TELLER (J. Physical Chem., 1937, 41, 109—116).—The difference between diat. and polyat. mols. in respect of the possible crossing of electronic energy levels is discussed mathematically. J. W. S.

Ionisation potential of carbon monoxide. J. SAVARD, M. DE HEMPTINNE, and P. CAPRON (Compt. rend., 1937, 204, 354—356).—Investigations previously reported for N_2 (cf. A., 1935, 1047) are extended to CO, using a Ta apparatus to obviate N_2 occlusion errors. Observed and calc. vals. and interpretations are tabulated in the range 12.5—19.1 e.v. Evidence supports the val. 13.5 e.v. as the ionisation potential of the normal mol. N. M. B.

Force constants and fundamental vibrations of diacetylene. T. Y. WU and S. T. SHEN (Chinese J. Physics, 1936, 2, 128—134).—A new assignment of fundamental frequencies in accordance with the selection rules is suggested (cf. Timm, A., 1935, 681), and 9 force consts. for the mol. are calc. N. M. B.

Characteristics associated with the constants of the diatomic halogen and alkali molecules. N. R. TAWDE (J. Univ. Bombay, 1936, 5, Part II, 7—15).—A simple, empirical relation, particularly applicable to groups of analogous mols. such as halogens and alkalis, expresses roughly the nuclear frequencies of non-symmetrical mols. in terms of those of symmetrical mols. Other consts. associated with these groups are discussed in terms of the harmonic force law. E. S. H.

Lattice energies, equilibrium distances, compressibilities, and characteristic frequencies of alkali halide crystals. M. L. HUGGINS (J. Chem.

Physics, 1937, 5, 143—148).—Using re-calc. consts. in the Born and Mayer exponential expression for the repulsion between two ions, lattice energies and equilibrium distances between the ions of alkali halide crystals have been computed. Expressions have been derived from which compressibilities and max. infra-red frequencies have been calc. and the relation between these two quantities is approximated by Madelung's empirical equation (Physikal. Z., 1910, 11, 898). W. R. A.

Photometric determination of the intensity of X-rays diffracted by sodium chloride. O. R. FOZ (Anal. Fis. Quim., 1936, 34, 748—765).—Measurements made with Cu $K\alpha$ rays differ slightly from those for Mo $K\alpha$ obtained by Havighurst (A., 1927, 95). The possibility that the scattering factor may $\propto \lambda$ (cf. Honl, A., 1934, 3) is discussed.

F. R. G.

X-Ray ionisation chamber materials. J. N. SAYLER (Physical Rev., 1935, [ii], 48, 472—473).—The rates of discharge of α -particles from rolled steel, electroplated metals, Pt foil, Mo, and Pyrex glass are recorded. L. S. T.

Intensities of X-ray reflexions from bismuth crystals between 25° and 530° abs. A. GOETZ and R. B. JACOBS (Physical Rev., 1937, [ii], 51, 151—159).—Full data for the temp. variation of the integrated intensities, of reflexions of Mo $K\alpha$ radiation from Bi crystals on (111) are given. The ratio J_T/J_N follows the Debye-Waller relation. The calc. characteristic temp. of Bi are 92.5° and 95.9° without and with consideration of the zero-point energy, respectively. Measurements support the assumption of zero-point energy. No indication of a discontinuity of J_T/J_0 was found in the region of the pseudo-allotropic transformation point at 75°, but a deviation begins 50—80° below the m.p.

N. M. B.

Effect of chlorine ions on X-ray diffraction in aqueous solution. G. W. STEWART (Physical Rev., 1935, [ii], 48, 473).—The structure of Cl^- is discussed in the light of measurements of its effect on the X-ray diffraction of aq. NH_4Cl . L. S. T.

Effect of thermal agitation on the reflexion of X-rays by crystals. S. Y. SZE (Chinese J. Physics, 1936, 2, 124—127).—Mathematical. A simplified wave-mechanical derivation of the temp. factor is given (cf. Zener, A., 1936, 273). N. M. B.

Determination of the gas-covered part of a surface of contact. R. FRICKE and R. MUMBRAUER (Naturwiss., 1937, 25, 89—90).—The emanation from certain active kinds of $\alpha\text{-Fe}_2\text{O}_3$ when treated by the emanation method of Hahn, and the total surface of the substance per g.-mol. determined by X-ray methods, give smaller vals. of the recoil range of the short-lived Th emanation than those obtained by other methods. This indicates that the surface area calc. from X-ray observations is about 2% < that from the emanation method. Secondary structure must play a great part in the latter. Hahn's method is of special val. in the investigation of contacts. A. J. M.

O (A., I.)

Computations related to liquid structure by the methods of trial and of Fourier series analysis. G. A. BOYD (Physical Rev., 1935, [ii], 48, 473). L. S. T.

Nucleus formation in recrystallisation. III. Orientation of recrystallisation nuclei. M. KORN-FELD (Physikal. Z. Sovietunion, 1936, 10, 142—153).—The structure of single crystals of Al deformed by extension has been examined with special reference to the orientation of its various parts. The velocity of formation of recrystallisation centres is a max. at those parts of the plastically deformed crystal where the orientation is altered. A. J. M.

Crystals of sodium ferrocyanide decahydrate. O. M. ANSHELES and M. P. GOLOVKOV (Trans. State Inst. Appl. Chem. U.S.S.R., 1935, No. 23, 13—17).— $\text{Na}_4\text{Fe}(\text{CN})_6$ crystallises with 10 and not with 12 H_2O . CH. ABS. (e)

Generalisation of the Bravais law. J. D. H. DONNAY and D. HARKER (Compt. rend., 1937, 204, 274—276).—A generalised form of the law is given, and its application to orthorhombic S, granite, and pyrites discussed. A. J. E. W.

Chemical constitution and crystal structure, especially with intermetallic compounds. J. M. BIJVOET (Chem. Weekblad, 1937, 34, 95—107).—A lecture. S. C.

Structure of liquid metals. V. DANILOV and I. RADTSCHENKO (Physikal. Z. Sovietunion, 1936, 10, 260).—X-Ray structure diagrams of the free plane surfaces of liquid Bi, Sn, and Pb in an evacuated vessel indicate that the structure of Pb is similar to that of Hg, and that of Bi and Sn is similar to the structure of the metal in the cryst. state. A. J. M.

Scattering of X-rays in liquid alloys. V. DANILOV and I. RADTSCHENKO (Physikal. Z. Sovietunion, 1936, 10, 261).—X-Ray scattering diagrams have been obtained for the eutectic mixtures of Bi-Sn, Bi-Cd, Sn-Pb, Sn-Zn, and Bi-Pb systems. Sn-Pb and Bi-Sn alloys give a diffraction pattern similar to Pb and Bi, respectively. A. J. M.

Crystal chemistry. III. Structure of binary compounds. AX compounds. IV. AX_2 , A_2X_3 , AX_3 , AX_4 compounds. C. W. STILLWELL (J. Chem. Educ., 1936, 13, 521—525, 566—575; cf. A., 1936, 1464).—III. The structures of CsCl, NaCl, NiAs, ZnO, and ZnS are discussed in detail, as well as that of BN. The influence of polarisation on the ionic and covalent linkings is also discussed.

IV. A summary and discussion. L. S. T.

Crystal structure of $\text{NaOH}\cdot\text{BF}_3$ and of the alkali borofluorides and TlBF_4 . L. J. KLINKENBERG (Rec. trav. chim., 1937, 56, 36—40; cf. A., 1936, 275).—Crystallographic data are: NaBF_4 , a 6.25, b 6.77, c 6.82 Å.; CsBF_4 , a 9.43, b 5.83, c 7.65 Å.; TlBF_4 , a 9.47, b 5.81, c 7.40 Å. The unit cells contain 4 mols. Space-group, $V_2^2 = D_{2h}^{10}$. The borofluorides are isomorphous with the corresponding perchlorates. $\text{NaOH}\cdot\text{BF}_3$ (I) is $\text{Na}[\text{BF}_3(\text{OH})]$. Dissociation pressures and heats of dissociation of (I) and NaBF_4 are given, and their stability is discussed. A. J. E. W.

Crystal structure of thiophosphoryl bromide. I. NITTA and K. SUENAGA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 121—124).—The X-ray crystal structure of PSBr_3 has been determined. The unit cube, of edge 11.03 Å., contains 8 mols., giving $d_{\text{calc.}}$ 2.99 ($d_{\text{obs.}}$ 2.97). The atoms of P and S are on the trigonal axes. The possibility of the existence of double mols. is discussed. R. S. B.

Substitution of water by ammonia and pyridine in complexes. P. SPACU (Bull. Soc. chim., 1937, [v], **4**, 307—311).—X-Ray powder diagrams and mol. vols. of $[\text{CdCl}_4][\text{Cu}(\text{H}_2\text{O})_4]$ and $[\text{CdCl}_4][\text{Cu}(\text{NH}_3)_4]$ are similar, whilst those for $[\text{CdCl}_4][\text{Cu}(\text{C}_5\text{H}_5\text{N})_4]$ are different. The results are discussed in relation to structure. E. S. H.

Crystal structure of silver diammino-tetra-nitro-cobaltate $\text{Ag}[\text{Co}(\text{NH}_3)_2(\text{NO}_2)_4]$. A. F. WELLS (Z. Krist., 1936, **95**, 74—82).—The structure is tetragonal, a_0 6.97, c_0 10.43 Å., space-group $P4/nnc$, 2 mols. in cell. It is essentially a deformed face-centred cubic packing; interionic distances are given. The complex ion $[\text{Co}(\text{NH}_3)_2(\text{NO}_2)_4]^-$ is in the *trans* configuration, whereas chemically the *cis* configuration was expected. B. W. R.

Structure of dichlorodibromomethane. P. CAPRON and S. L. T. PERLINGHI (Bull. Soc. chim. Belg., 1936, **45**, 730—731).—Of two suggested structures which agree with diffraction data, a tetrahedron with the following dimensions is preferred. C—Cl, 1.75; C—Br, 1.93; Cl—Cl, 1.86; Br—Br, 3.15; Cl—Br, 3.01 Å. C. R. H.

Unit cell and space group of acetylsalicylic acid. I. NITTA and T. WATANABE (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, **31**, 125—128).—The X-ray crystal structure has been determined. The unit cell (4 mols.) has a 11.37, b 6.54, and c 11.57 Å., giving $d_{\text{calc.}}$ 1.41 ($d_{\text{obs.}}$ 1.396 at 30°). A chain-like structure parallel to [010] is suggested. R. S. B.

X-Ray investigation of triphenylmethane. M. PRASAD, L. A. DE SOUSA, and J. SHANKER (J. Univ. Bombay, 1936, Part II, **5**, 109—113).—The dimensions of the unit cell are: a 14.71, b 25.72, c 7.55 Å. Calculation of d shows that the no. of mols. per unit cell is double that required by the space-group C_{2v}^2 . It appears that 2 mols. polymerise to form an asymmetrical unit of the elementary cell. E. S. H.

Crystal structure of the aliphatic compounds. I, II. Y. TANAKA and R. KOBAYASI (J. Soc. Chem. Ind. Japan, 1936, **39**, 411—417B).—I. The diamond lattice structure explains the crystallographic properties of *n*-paraffins. The derivation of the paraffin wax lattice from the diamond lattice is discussed and the main diameter of $n\text{-C}_n\text{H}_{2n+2}$ calc.

II. Various structural characteristics of *n*-paraffins according to the paraffin wax lattice are calc.

T. W. P.

X-Ray study of phthalocyanines. III. Quantitative structure determination of nickel phthalocyanine. J. M. ROBERTSON and I. WOODWARD (J.C.S., 1937, 219—230; cf. A., 1936, 1186).—The structure of Ni phthalocyanine (I), determined from X-ray crystal data for the (*h*0*l*) zone of reflexions, is expressed by a contoured electron-density

map in which every atom is separately resolved. The orientation of the planar mol. in the crystal is nearly identical with that of free phthalocyanine (II). The structures also are closely similar, but each of the isoindole N atoms in (I) is shifted inward towards the Ni atom. The C—N interat. distance is 1.38 Å. The mol. is more nearly tetragonal than that of (II). F. L. U.

X-Ray study of linear polyesters. C. S. FULLER and C. L. ERICKSON (J. Amer. Chem. Soc., 1937, **59**, 344—351).—Debye-Scherrer photographs of polyethylene sebacates of increasing average mol. wt. are identical and show the same interplanar spacings as the fibre diagrams of the oriented materials. Fibre diagrams of six highly-oriented polyesters show that the chain mols. are parallel to the axes of the fibres. Polyethylene succinate has a helical arrangement of the chain atoms, whilst polyethylene adipate, azelate, and sebacate possess similar configurations which deviate only slightly from the planar zig-zag form. The sebacate polyesters of trimethylene glycol and diethylene oxide glycol also appear to have a non-planar configuration of chain atoms. Deviations from the planar zig-zag type of chain are ascribed to attractive forces in the ester groups. E. S. H.

Highly polymerised compounds. CLIII. Constitution of cellulose. H. STAUDINGER (Svensk Kem. Tidskr., 1937, **49**, 3—23).—A review. A. G.

Structure of proteins as revealed by X-rays. H. MARK and H. PHILIPP (Naturwiss., 1937, **25**, 119—124).—A review.

Dynamical theory of electron diffraction and its application to some surface problems. J. W. HARDING (Phil. Mag., 1937, [vii], **23**, 271—294).—A theory of electron diffraction based on that of Darwin for X-ray diffraction has been developed. A generalisation of Darwin's treatment has been made to allow for an arbitrary arrangement of planes near the crystal surface, and application is made to the case of thick and thin crystals, and to crystals with a base structure within the fundamental cell. The discrepancy between the observed breadth of the region of selective reflexion in the case of the diamond and that calc. by the theory of Bethe (A., 1928, 1303) is discussed. The few planes at the surface of the crystal are probably out of phase with the rest of the crystal, an effect which may be produced by the contraction of crystal spacings near the surface, or by the adsorption of a film of foreign matter. Calculation indicates the second to be the more probable.

A. J. M.

Electron diffraction of long-chain organic compounds. L. H. STORKS and L. H. GERMER (J. Chem. Physics, 1937, **5**, 131—134).—The electron diffraction pattern of lard points to the axes of the hydrocarbon chains being inclined at 27° to the surface normal and to a C—C separation of 2.50 Å. Tristearin, stearic acid (I), and Me stearate (II) have also been investigated. The chain of (I) is inclined at 33° and that of (II) at 25° to the surface normal. In both these mols. the C—C separation is 2.50 Å., in good agreement with the known distance between alternate C in a zig-zag chain. W. R. A.

Dependence of magnetic after-effect on inner strains. H. KINDLER (Ann. Physik, 1937, [v], 28, 375—384).—The after-effect loss angle ϵ_n of a 50% Fe-Ni alloy increases with applied tension to a max. val. at 14 kg. per sq. mm. (elastic limit). Above this tension ϵ_n decreases with increasing tension. For Heusler's alloy (Al 17.7, Mn 16.0, Cu 65.3 at.-%) varies with the temp. T at which the alloy was annealed. ϵ_n for T 181° is > for T 123°. O. D. S.

Variation of the magnetic anisotropy of iron with temperature. E. F. TRTOV (Physikal. Z. Sovietunion, 1936, 10, 337—347).—On the basis of Akulov's theory (cf. A., 1929, 1224) it is deduced that the character of the anisotropy of a crystal does not vary with temp. and that the anisotropy const., K , $\propto J^{10}$, where J is the saturation intensity. Measurements of the variation from 0° to 400° of K for single crystals of Fe and polycryst. Fe agree with this theory. O. D. S.

Effect of stretching and twisting on the discontinuous process of magnetisation in nickel, iron, and nickel-iron alloys. J. OKUBO and M. TAKAGI (Sci. Rep. Tohoku, 1936, 25, 426—479).—The discontinuities occur mainly in the steep portion of the hysteresis loop. The effects of increased stretching or twisting stress can be explained by considering the distribution of the magnetic axes of atoms in the material to be of a prolate or oblate spheroidal type. J. W. S.

Behaviour of thermal current in galena crystals on one-sided pressure. K. BALYI (Fold. Koz., 1935, 65, 153—162; Chem. Zentr., 1936, i, 2044).—The electric current produced by non-homogeneous pressure is parabolically related to the stress. The direction of the current is towards or away from the pressure in different crystals, and for any one crystal coincides with the direction of the thermal current. J. S. A.

Index of refraction of cerussite for X-rays. J. E. FIELD and G. A. LINDSAY (Physical Rev., 1937, [ii], 51, 165—169).—Vals of n for fourteen $\lambda\lambda$ in the range 2500—3600 and 4800—5400 Å were measured, and the five M absorption limits of Pb were found. The decrease in δ/λ^2 , where $\delta = 1 - n$, in the vicinity of an absorption edge is examined. N. M. B.

Indicatrices of reflecting power of crystals of low absorbing power. L. CAPDECOMME and G. JOURAVSKY (Compt. rend., 1937, 204, 137—139).—Theoretical. A. J. E. W.

Crystallo-optical study of aluminium hydroxide obtained at the experimental plant of GIPKH. M. P. GOLOVKOV (Trans. State Inst. Appl. Chem. U.S.S.R., 1935, No. 23, 8—10).—Synthetic $Al_2O_3 \cdot 3H_2O$ resembles natural gibbsite in its optical and crystallographic properties. CH. ABS. (e)

Optical investigation of thin silver and silver iodide layers. G. ESSERS (Ann. Physik, 1937, [v], 28, 297—318).—A method is described by which the thickness of thin transparent and absorbing layers (e.g., AgI films from 10 to 100 m μ , and Ag films from 5 to 25 m μ) can be determined by measurement of the polarisation of light reflected from the layers.

Vals. for AgI films agree with those found by Newton's rings. The optical consts. of Ag films were determined and are in qual. agreement with those of Murrmann (A., 1933, 332). An increase in n and a decrease in absorption were observed at thicknesses <7 to 8 m μ . For AgI films n was found to decrease at thicknesses <15 m μ . O. D. S.

Optical properties and crystal structure of some compounds of type R_nMX_4 . D. P. MELLOR and F. M. QUODLING (J. Proc. Roy. Soc. New South Wales, 1936, 70, 205—210).—Compounds R_nMX_4 show much stronger double refraction when MX_4 is square (by X-ray analysis) than tetrahedral. This relationship has been investigated for $K_2[Ni(CN)_4] \cdot H_2O$, $NMe_4[AuCl_4]$, $K[AuBr_4]$, $Ca_2[CuCl_4]$, and $[Pd(NH_3)_4]Cl_2 \cdot H_2O$ and the results are correlated with known data for other Au, Cu, Pd, and Pt compounds. A. Li.

Solidity and elasticity of thin quartz threads. O. REINKOBER (Physikal. Z., 1937, 38, 112—122).—The effect of various surface conditions on the solidity and elasticity of quartz threads is considered. Adsorbed surface films lower the solidity of the thread. A. J. M.

Influence of temperature on the plasticity of crystals. P. E. DUVEZ (Physical Rev., 1935, [ii], 48, 484).—The theory of the plasticity of crystals (A., 1935, 572) is extended to take account of the effect of temp. on the stress-strain curve. L. S. T.

Structure of a heavy deposit of solid selenium condensed from the vapour, the liquid being at about 250°. L. E. DONN (Physical Rev., 1935, [ii], 48, 479—480; cf. A., 1936, 1450).—In general, the deposit is microcryst., with a grosser structure of (?) crystal units. L. S. T.

Physical properties of thin metal films. H. LANGE (Kolloid-Z., 1937, 78, 231—240).—A review.

Rate of polymorphic transformations. V. Effect of mechanical deformation on rate of transformation of polymorphic metals. III. Effect of metallic admixtures. II. E. COHEN and A. K. W. A. VAN LIESHOUT (Z. physikal. Chem., 1937, 178, 221—226; cf. A., 1936, 1452).—Minute amounts of Co, Mn, and Te greatly accelerate the transformation of deformed white into grey Sn. Fe, Ni, and Cu have practically no effect. Pb, Cd, and Au retard. Al and Bi present together in equal amounts cause retardation. Small amounts of foreign metals also affect the rate of transformation of cast white Sn. R. C.

Allotropy of the chemical elements. A. SCHULZE (Chem.-Ztg., 1937, 61, 87—88, 108—110).—A review. H. J. E.

Variety and mutual conditions of polymorphous transformations of potassium nitrate. W. BORCHERT (Z. Krist., 1936, 95, 28—53).—With rising temp. rhombic KNO_3 (β) changes into trigonal KNO_3 (α) at 128°. With falling temp., α at 123° suddenly acquires a mosaic character (α^*) and at 113° changes into finely-divided β -variety (β_μ). Other varieties (α_0 and β^*) appear, the difference being one essentially of grain size and orientation. The transformations of these various phases are complicated and require

> a single diagram for their statement; they may be traced by the help of Laue pictures. B. W. R.

Superconducting state. J. C. SLATER (Physical Rev., 1937, [ii], 51, 195—202).—The hypothesis that the superconducting state of metallic electrons may arise by application of perturbation theory to Bloch's theory of the metallic state is examined. Known cases of absence of superconductivity in certain metals are accounted for. N. M. B.

Critical values of field strength and current for the superconductivity of tin. L. V. SCHUBNIKOV and V. I. CHOTKEVITSCH (Physikal. Z. Sovietunion, 1936, 10, 231—241).—The superconductivity of a Sn ring is destroyed if the current produces a field at the surface of the wire > a crit. val. If an external field is applied, the superconductivity of the Sn disappears when the tangential component of the field reaches the crit. val. In an external magnetic field the superconductivity of a ring through which a current is flowing is destroyed when the sum of the tangential components of the external field and that due to the current becomes > the crit. val., at any one place in the ring. A. J. M.

Absorption of infra-red light in superconductors. J. G. DAUNT, T. C. KEELEY, and K. MENDELSSOHN (Phil. Mag., 1937, [vii], 23, 264—271).—Neither Pb nor Sn showed any change in absorption of infra-red light on being transformed from the superconductive into the normal state. It is concluded that the no. of superconducting electrons is very small or, more probably, all electrons pass into the superconductive state, but are not by any means entirely free. A. J. M.

Temperature variation of the abnormal unidirectional diamagnetism of graphite crystals. K. S. KRISHNAN and N. GANGULI (Nature, 1937, 139, 155—156).—The magnetic anisotropy of graphite, $\chi_{||} - \chi_{\perp}$, diminishes from approx. -28×10^{-6} at 140° abs. to approx. -7.8×10^{-6} at 1270° abs.; χ_{\perp} varies from -1.4×10^{-6} at 100° abs. to -0.5×10^{-6} at room temp., and -0.4×10^{-6} at 940° abs. L. S. T.

Paramagnetic susceptibility of colloidal powder of platinum. N. TAKATORI (Sci. Rep. Tohoku, 1936, 25, 489—503).—The paramagnetic susceptibility of Pt decreases from 1.01 to 0.78×10^{-6} during change of particle size from 15 to 0.20×10^{-4} mm. The particle size of colloidal Pt is 1.8 — 3.0×10^{-5} mm., and its lattice const. is 0.018% > for the same powder annealed. J. W. S.

Magnetochemical investigations. II. Complex platinum compounds. J. A. CHRISTIANSEN and R. W. ASMUSSEN (Kong. dansk. Vid. Selsk., mat.-fys. Medd., 1935, 13, No. 11, 14 pp.; Chem. Zentr., 1936, i, 1817; cf. A., 1935, 573).—A large range of complex Pt^{II} compounds has been examined and found to be uniformly diamagnetic. J. S. A.

Active iron. X. Magnetic characterisation of the ferric monodipyridyl complex and the magnetism of complex ferrous pentacyanides. A. SIMON, G. MORGENSTERN, and W. H. ALBRECHT (Z. anorg. Chem., 1937, 230, 225—238; cf. this vol., 94).—Susceptibilities of $[\text{Fe}(\text{dip})]\text{Cl}_3$ have been meas-

ured at temp. between 95° and 289° abs. Potential measurements and electrometric titration with AgNO_3 show that all three Cl atoms are ionisable. Susceptibilities of $\text{Na}_3[\text{Fe}(\text{CN})_5\text{X}]$ ($\text{X} = \text{NH}_3, \text{H}_2\text{O}, \text{NO}_2, \text{AsO}_2, \text{CO}, \text{SO}_3, \text{C}_5\text{H}_5\text{N}$) are also given. F. L. U.

Magnetochemical studies. XXIII. Rhenium compounds. W. KLEMM and G. FRISCHMUTH (Z. anorg. Chem., 1937, 230, 220—222; cf. A., 1936, 786).—Susceptibilities $\times 10^6$ of the following compounds are given at 20° : $[\text{Re}(\text{NH}_3)_6]\text{Cl}_3$, 0; $[\text{Re}(\text{NH}_3)_6]\text{Br}_3$, +90; $\text{Rb}[\text{ReCl}_4]$, -65; Na_2ReO_3 , +20 and -5; $[\text{Re}(\text{NH}_3)_6]\text{Cl}_5$, -190; $\text{K}_3[\text{ReO}_2(\text{CN})_4]$, -40; $\text{Ti}_3[\text{ReO}_2(\text{CN})_4]$, -270. F. L. U.

Magnetic behaviour of alums of the iron group. II. A. SIEGERT (Physica, 1937, 4, 138—152; cf. A., 1936, 417).—Theoretical. H. J. E.

Directions of easy magnetisation in ferromagnetic cubic crystals. R. M. BOZORTH and L. W. MCKEEHAN (Physical Rev., 1937, [ii], 51, 216).—An explanation of the stable directions of magnetisation in terms of the distribution of magnetic dipoles in the atoms of Fe and Ni is proposed. N. M. B.

Conditions of coherence in the [optical] diffraction spectrum produced by stationary ultrasonic waves in liquids. R. BAR (Helv. phys. Acta, 1935, 8, 591—600; Chem. Zentr., 1936, i, 1793).—Any pair of spectra, both of odd or both of even order, possess some proportion of coherent light, but odd and even spectra are mutually incoherent. Results agree with Brillouin's theory. J. S. A.

Absorption of ultrasonic waves in benzene. E. BAUMGARDT (Compt. rend., 1937, 204, 416—418).—Vals. of the absorption coeff. in the frequency range 850—2100 kc. per sec. were determined. A. J. E. W.

Physical properties of isoprene. N. BEKKE-DAHL, L. A. WOOD, and M. WOJCIECHOWSKI (J. Res. Nat. Bur. Stand., 1936, 17, 883—894).—The following have been determined: b.p. (T) $34.076 \pm 0.003^{\circ}$, $dT/dp = 0.0382^{\circ}$ per mm., f.p. = $-146.8 \pm 0.2^{\circ}$, $d^{20} = 0.6805 \pm 0.0001$, $n_D^{20} = 1.42160 \pm 0.00005$, mol. refraction 25.39, d between b.p. and f.p. = $0.7002 - 0.9754 \times 10^{-3}t - 0.592 \times 10^{-6}t^2 + 0.525 \times 10^{-9}t^3 + 9.66 \times 10^{-12}t^4$, where t = temp., latent heat of vaporisation from the Clausius-Clapeyron equation 6.17 kg.-cal. per mol., n_D from 0° to b.p. $1.43472 - 0.656 \times 10^{-3}t$. R. S. B.

Ebulliometric and tonometric researches on chemically pure liquids. III. Carbon tetrachloride as a physico-chemical standard. A. ZMACZYNSKI (Rocz. Chem., 1936, 16, 486—501).—Pure CCl_4 has b.p. 76.686° , d_4^{20} 1.58445, and 1.46044. CS_2 and H_2O , but not CHCl_3 , are readily separated from CCl_4 by fractionation; CHCl_3 is absent from CCl_4 prepared from CS_2 . CCl_4 is resistant to light and atm. O_2 at high temp. and pressures, and is a suitable ebulliometric standard. R. T.

Determination of certain physico-chemical constants of benzene. M. WOJCIECHOWSKI (Rocz. Chem., 1936, 16, 524—534).—The purest C_6H_6 obtained by fractional crystallisation or distillation

methods has m.p. $5.51 \pm 0.01^\circ$, b.p. $80.093 \pm 0.002^\circ$, $n_D^{25} 1.49807 \pm 0.00006$, and $d_4^{25} 0.873670 \pm 0.000004$.

R. T.

Influence of the terminal group on the m.p. of normal chain aliphatic compounds. P. CARRÉ and H. PASSEDOUET (Compt. rend., 1937, 204, 347—349).—A curve of m.p. plotted against the no. of C in a series of urethanes corresponding with normal primary alcohols C_1 — C_{16} shows irregularities which are discussed in relation to the occurrence of odd or even nos. of C.

N. M. B.

Specific heat of iodine. L. G. CARPENTER and T. F. HARLE (Phil. Mag., 1937, [viii], 23, 193—208).— C_p and C_v have been obtained for solid and liquid I between 202.2° and 432.7° abs. The C_p - T curve is of the usual general form, but passes through a flat max. about 300° abs., and decreases slightly as the m.p. is approached. Up to a temp. $10^\circ < \text{m.p.}$, C_p is $\approx 3R$. The average val. of the mean sp. heat of solid I from room temp. to 100° is about 3% $<$ true sp. heat. No evidence of the existence of two forms of I with a transition temp. at 47° could be found. For liquid I, C_p is approx. 10 g.-cal. per g.-atom, and C_v is approx. $3R$. Hence the no. of degrees of freedom in the liquid is \approx the no. in the solid.

A. J. M.

Ammonia. Heat capacity and vapour pressure of solid and liquid. Heat of vaporisation. Entropy values from thermal and spectroscopic data. R. OVERSTREET and W. F. GLAUQUE (J. Amer. Chem. Soc., 1937, 59, 254—259).—Heat capacities have been determined at 15° abs. to the b.p. NH_3 has m.p. 195.36° abs., b.p. 239.68° abs., heat of fusion 1351.6 g.-cal. per mol., heat of vaporisation at the b.p. 5581 g.-cal. per mol. The v.p. of solid NH_3 (176.92 — 195.36° abs.) is given by $\log_{10} P = 1630.700/T + 0.00593$, and that of liquid NH_3 (199.26 — 241.59° abs.) by $\log_{10} P = -1612.500/T - 0.012311T + 0.000012521T^2 + 10.83997$. The calc. mol. entropy of the gas at the b.p. is 44.13 ± 10 e.u. The abs. entropy at 298.1° abs. is 52.22 g.-cal. per degree per mol.

E. S. H.

Test of the third law of thermodynamics by means of two crystalline forms of phosphine. Heat capacity, heat of vaporisation, vapour pressure, and entropy of phosphine. C. C. STEPHENSON and W. F. GLAUQUE (J. Chem. Physics, 1937, 5, 149—158).—A new form of PH_3 stable at $<49.43^\circ$ abs. is reported. Heat capacities of the stable and unstable forms have been measured down to 15.0° abs. and results verify the third law. A region of abnormally high heat capacity in the metastable form exists between 30.29° and 35.66° abs. which cannot be explained by assuming a change of state. B.p., m.p., and transition points and corresponding heats of vaporisation, fusion, and transition have been measured. The entropy of solid PH_3 at 49.43° abs. has been calc. from measurements in the stable and unstable forms and the vals. so obtained agree. The entropy at 298.1° abs. agrees well with the spectroscopically determined val. The odd moment of inertia, the P—H distance, and the bond angle ($98 \pm 5^\circ$) are evaluated.

W. R. A.

Heat capacity of ethane from 15° abs. to the b.p. Heat of fusion and heat of vaporisation. R. K. WITT and J. D. KEMP (J. Amer. Chem. Soc., 1937, 59, 273—276).—Heat capacities are recorded. C_2H_6 has m.p. $89.87 \pm 0.1^\circ$ abs., heat of fusion 682.9 g.-cal. per mol., heat of vaporisation at the b.p. 3514 g.-cal. per mol. The calc. entropy of the gas at the b.p. is 49.54 e.u., and at 298.1° abs. is 54.85 e.u.

E. S. H.

Entropy of ethane and the third law of thermodynamics. Hindered rotation of methyl groups. J. D. KEMP and K. S. PITZER (J. Amer. Chem. Soc., 1937, 59, 276—279).—The entropy of C_2H_6 has been calc. from the heat and free energy of hydrogenation of C_2H_4 , considering C_2H_6 as a restricted internal rotator. Comparison of the vals. with those obtained from calorimeter measurements extending to low temp. by the use of the third law of thermodynamics proves the correctness of the third law val. Evidence of the existence of a potential barrier of about 315 g.-cal. per mol., restricting the internal rotation of the Me groups in C_2H_6 , has been obtained.

E. S. H.

Entropy and the symmetry of the benzene molecule. R. C. LORD, jun., and D. H. ANDREWS (J. Physical Chem., 1937, 41, 149—158).—From the vibrational frequencies of C_6H_6 and C_6D_6 , and assuming a symmetry no. of 12, the entropies of translation, vibration, rotation, and symmetry are calc. The total entropy is in good agreement with the val. calc. from thermal data.

J. W. S.

Density of liquid selenium. S. DOBINSKI and J. WESOŁOWSKI (Bull. Acad. Polonaise, 1936, A, 446—450).— d , determined by a displacement method between 228° and 345° , is given by $d = 3.987 - 0.0016(t - 220)$.

J. S. A.

Comparative densities of fresh and aged lead sulphate. (MME.) S. T. PERLINGHI and C. ROSENBLUM (J. Chinese Chem. Soc., 1937, 5, 25—34).—For aged PbSO_4 $d^{16.4}$ is 6.17, whereas d for the freshly prepared salt is 1.8—6.5% less, the greatest difference being obtained when H_2O is used as a covering liquid.

R. S. B.

Densities of fine powders. J. L. CULBERTSON and A. DUNBAR (J. Amer. Chem. Soc., 1937, 59, 306—308).—The apparent d of charcoal and SiO_2 gel in H_2O , CCl_4 , C_6H_6 , and light petroleum have been determined. The vals. for SiO_2 are highest in H_2O and lowest in light petroleum, but the reverse order holds for charcoal. The influences of interfacial tension and compression of liquids at the interface are discussed.

E. S. H.

Carbon rings. XXIX. Density curves of cyclic diketones. L. RUZICKA (Helv. Chim. Acta, 1937, 20, 128—132; cf. A., 1934, 1220).— d has been determined for cyclohexane-1:3-dione and cyclo-decane-1:5-dione. With cyclic diketones d decreases continuously as the no. of ring members increases. A continuously falling d graph is not therefore characteristic solely of heterocyclic systems but also generally of those with relatively low H content whether carbocyclic or heterocyclic. The abnormally great d of certain rings with 10—14 members is

ascribed to the large sphere of activity of the H atoms or of the ring members united with H.

H. W.

Hexane and some hydrocarbons. A. MAMAN (Publ. sci. tech. Min. de l'Air, 1935, No. 66, 1—55; Chem. Zentr., 1936, i, 2332).—Accurate physical properties and solubilities for many hydrocarbons are recorded.

H. N. R.

Vaporisation of hydrocarbons and hydrocarbon mixtures. M. SCHMITT (Publ. sci. tech. Min. de l'Air, No. 54, 1—139; Chem. Zentr., 1936, i, 2061—2062).—Static measurements give the following results: for PhMe, $\log p = 6.06446 - 1414.26/(227.82 + t)$; for cyclohexane, $\log p = 5.97843 - 1274.32/(230.17 + t)$; for *n*-hexane, $\log p = 5.99209 - 1235.31/(231.50 + t)$; for methylcyclopentane, $\log p = 5.88543 - 1205.89/(229.09 + t)$. Results for C_6H_6 are more complex and depend on the ratio of vapour to liquid vol.

H. N. R.

Vapour pressure of hydrogen deuteride. R. B. SCOTT and F. G. BRICKWEDDE (Physical Rev., 1935, [ii], 48, 483).—Data for 99.95% HD in the range 13.92—20.38° abs. are given. After 15 days no reversion to the equilibrium mixture of H_2 , HD, and D_2 could be detected by a change in v.p.

L. S. T.

Vapour isotherms and the condensation line of carbon dioxide. VIII. K. JABECZYNSKI (Rocz. Chem., 1936, 16, 566—573).—Theoretical.

R. T.

Vapour pressures of aluminium iodide. E. MOLES and A. VIAN (Anal. Fis. Quim., 1936, 34, 782—786; cf. A., 1936, 945).—The author's earlier data are in agreement with those of Fischer *et al.* (A., 1932, 565).

F. R. G.

Heat conduction in rarefied gases. E. FREDLUND (Ann. Physik, 1937, [v], 28, 319—324).—Theoretical. An expression for the temp. drop coeff. of polyat. gases is obtained by comparison of the formulae of Knudsen and of Smoluchowski for the heat conductivity of rarefied gases.

O. D. S.

Thermal conductivity of unsaturated gaseous hydrocarbons at low pressure. R. DELAPLACE (Compt. rend., 1937, 204, 263—265; cf. this vol., 125).—Comparative data for seven hydrocarbons and H_2 , for the pressure range 0—0.3 mm., are given. κ for the hydrocarbons is const. at pressures > 0.15 mm.

A. J. E. W.

Thermal conductivity of tungsten. W. C. MICHELS and (Miss) M. COX (Physics, 1936, 7, 153—155).—The theory of heat losses from an electrically heated wire (Proc. Roy. Soc., 1931, A, 131, 320; 1932, A, 135, 192) is extended to include a wire supported by springs. The method has been applied to the determination of the thermal conductivity of W over the temp. range 78—273° abs., and indicates that the Wiedemann-Franz law breaks down in this region.

J. W. S.

Thermal expansion of the Bi lattice between 25° and 530° abs. R. B. JACOBS and A. GOETZ (Physical Rev., 1937, [ii], 51, 159—164).—Using the X-ray diffraction method with a Bragg spectrometer and movable slit, the expansion of the Bi lattice gave vals. 8.3×10^{-6} — 17.4×10^{-6} at 25°

to 120° abs., respectively, thereafter remaining unchanged to the m.p. An anomalous drop to 13.8×10^{-6} in the range between -15° and 75° indicates the existence of a separate phase not characterised by a change of the lattice configuration. The change in the lattice spacing for each temp. is calc. A divergence between lattice and integral expansion beginning 30° < m.p. is found. The Grüneisen rule is obeyed to a first approximation over the whole temp. range.

N. M. B.

Anomalous expansion of Seignette salt. J. HABLUTZEL (Helv. phys. Acta, 1935, 8, 498—500; Chem. Zentr., 1936, i, 2049).—The thermal expansion deviates considerably from linearity between -20° and 25°, the max. anomaly occurring at the electrical Curie point. Expansion in the crystal is locally non-homogeneous.

J. S. A.

Interrelations of compressibility, m.p., solubility, valency, and other properties of the halides of the alkalis and alkaline earths. S. BALCE (Philippine J. Sci., 1936, 60, 251—254).—The following formulae are considered to give better agreement with data than others more complicated: $K = V/5.6 \times 10^{12}Z$; $S = (5.7 - P)^3/10$; $T = 1500 \times (\Delta V)^{1/3} = 0.0113H/Z$; $H = 23330ZP$, where K = compressibility, V = mol. vol. of the solid, Z = valency, S = solubility in g. per c.c., P = electrolytic decomp. potential, T = m.p., ΔV = shrinkage in vol. per unit vol. incident to compound formation, H = heat of formation in g.-cal. (cf. A., 1935, 303).

C. R. H.

Influence of magnetic field on the viscosity of liquids in the nematic phase. M. MIESOWICZ (Bull. Acad. Polonaise, 1936, A, 228—247; cf. A., 1935, 1198).—The viscosities in the nematic phase of *p*-azoxy-anisole and -phenetole (I), measured by the damping of a plate vibrating perpendicularly in the liquid, are increased by the application of a horizontal magnetic field. The effect of the field decreases with rising temp., becoming zero at the transition point to the isotropic phase. With increasing field a saturation val. is reached, at about 3000 gauss for (I) at 143°. The effect is greatest when the magnetic field is perpendicular to the plane of the vibrating plate and least when the two are parallel.

O. D. S.

Copper-zinc diagram. J. SCHRAMM (Metallwirts., 1935, 14, 995—1001, 1047—1050; Chem. Zentr., 1936, i, 2819).—The occurrence of the peritectic reaction $\alpha + \text{melt} \rightarrow \beta$ at approx. 900° is confirmed. Congruent crystallisation or melting occurs at 834° (melt $\rightarrow \gamma$). The reported formation of Cu_2Zn_3 is not confirmed (cf. B., 1927, 939).

H. J. E.

Phase diagram of Cu-Zn at low temperatures. S. KONOBJEVSKI and V. TARASSOVA (Physikal. Z. Sovietunion, 1936, 10, 427—428).—The solubility of the α -phase of Cu-Zn has been determined from 167° to 400° by X-ray analysis of specimens brought to equilibrium by prolonged annealing after deformation; it decreases with falling temp.

O. D. S.

Equilibrium diagram of the copper-antimony system. I. Thermal analysis and microscopical examination. T. MURAKAMI and N. SHIBATA (Sci. Rep. Tohoku, 1936, 25, 527—568).—This

system embraces five branches with max. m.p. 683° (corresponding with Cu_3Sb_2) and eutectics at 645° (69.0% Cu) and 526° (23.5% Cu). The compounds $\text{Cu}_{11}\text{Sb}_3$, Cu_9Sb_2 , Cu_5Sb_2 , and Cu_2Sb are found to be present in the solid phase, forming solid solutions η , δ , β , and γ , respectively. The ranges of stability of the various phases are discussed. J. W. S.

K Absorption spectra of the elements nickel and copper in certain nickel-copper alloys. T. HAYASHI (Sci. Rep. Tohoku, 1936, 25, 598—605).—The fine structure of the absorption spectra of Ni and Cu in alloys (50% and 75% Ni) is similar to that for the pure metals, and shows no connexion with the magnetic properties. J. W. S.

Constitution of alloys of copper, aluminium, and silicon. I. Equilibrium diagrams of three binary systems. C. HISATSUNE (Tetsu-to-Hagane, 1935, 21, 726—742).—The equilibrium diagrams are described. CH. ABS. (e)

Zinc-rich portion of the system iron-zinc. E. C. TRUESDALE, R. L. WILCOX, and J. L. RODDA (Amer. Inst. Min. Met. Eng., Inst. Met. Div., 1935, Tech. Publ. 651, 37 pp.).—The solid solubility of Fe in Zn varies from 0.0009 to 0.0028%. The m.p. of Zn is 419.45° and the eutectic temp. $419.40 \pm 0.05^{\circ}$. The lower and upper peritectic temp. are $672 \pm 1^{\circ}$ and $782 \pm 1^{\circ}$ and the solubilities of Fe in molten Zn at 419.4° , 672° , 782° , and 875° are 0.018, 3.0, 7.4, and 9.2%, respectively. CH. ABS. (e)

Equilibrium diagram of the silver-rich silver-aluminium alloys: nature of the transformations. I. OBINATA and M. HAGIYA (Kinz.-no-Kenk., 1935, 12, 419—429).—In alloys with 5.6—8.2% Al a eutectoid and a metatectoid reaction take place at 615° and 420° , respectively. The latter ($\alpha + \gamma$, Ag_3Al) can easily be suppressed by H_2O -quenching the alloy, but the former (β , $\alpha + \gamma$) is only slightly affected by this means. Alloys quenched from the β -field consist of the γ -phase supersaturated with Ag. Quenched hypoeutectoid alloys show an anomalous increase of electrical resistance when heated at about 200° , which is attributed to the formation of Ag_3Al . The β -phase (7.98% Al) forms a body-centred cubic lattice (a 3.295 Å. at 700°). CH. ABS. (e)

Systems tin-germanium and tin-beryllium. W. GUERTLER and M. PIRANI (Tech. Publ. Internat. Tin Res. & Dev. Council, 1937, A, No. 50, 23 pp.).—Technique for the prep. of Sn-Ge alloys is described. The Sn-rich end of the Sn-Ge equilibrium diagram has been examined microscopically and thermally. The alloys consist of Ge crystals in a ground-mass of Sn containing 0.1—0.01% of Ge. The prep. of Sn-Be alloys is described. The alloys consist of Be crystals in a ground-mass of Sn containing a few tenths % of Be. The mechanical properties of Sn-rich Sn-Ge and Sn-Be alloys have been determined. E. S. H.

Anomalous mixed crystals in the system $\text{SrF}_2\text{--LaF}_3$. J. A. A. KETELAAR and P. J. H. WILLEMS (Rec. trav. chim., 1937, 56, 29—35).—X-Ray measurements show that mixtures containing 0—30 mol.-% LaF_3 give mixed crystals with a SrF_2 lattice. These are formed by replacement of Sr^{++} by

La^{+++} , the additional F^- ions occupying vacant lattice spaces. A. J. E. W.

Viscosity of mixed salt solutions. T. ISHIKAWA (Bull. Chem. Soc. Japan, 1937, 12, 16—24).—Published η data are successfully applied to the testing of the author's η formula (cf. A., 1929, 387), and comparison is made with 14 other η formulae.

C. R. H.
Flow and structural properties of sodium silicate solutions. I. N. SAVJALOV (J. Phys. Chem. Russ., 1936, 8, 411—419).—The viscosities of two Na silicate solutions ($\text{SiO}_2:\text{Na}_2\text{O} = 2.78$ and 3.05) have been found to obey Poiseuille's law and afford no evidence of "structural viscosity." The dependence of η on temp. has also been investigated.

E. R.
Applicability of the viscosity law of Staudinger to solutions of synthetic rubber. I. I. SHUKOV, V. A. KOMAROV, and E. I. GRIBOVA (Kolloid. Shurn., 1936, 2, 113—118).—The viscosity of solutions in C_6H_6 of a Na isoprene, a chloroisoprene, and three $\text{Na--C}_2\text{H}_4$ polymerides increases more rapidly than the concn., so that Staudinger's "const." is variable. In very dil. solutions, however, the variation is small.

J. J. B.
Experiments on the compressibility of binary solutions by electro-acoustic methods. V. V. TARASSOV, V. P. BERING, and A. A. SIDOROVA (J. Phys. Chem. Russ., 1936, 8, 372—382).—Compressibilities (β) of mixtures (1) $\text{H}_2\text{O} + \text{PhOH}$, (2) $\text{H}_2\text{O} + \text{EtOH}$, (3) $\text{H}_2\text{O} + \text{MeOEt}$, (4) $\text{COMe}_2 + \text{C}_6\text{H}_5\text{O}_3$, and (5) $\text{EtOAc} + \text{NH}_2\text{Ph}$ have been calc. from measurements of sound velocity. The β -composition curve has a min. at 25 mol.-% EtOH for (2), a sharp min. at 13 mol.-% MeOEt for (3), a min. at 50 mol.-% for (4), and three min., corresponding with the molar ratios 3:1, 3:2, and 1:1, in system (5). E. R.

Thermal dilatation of the system $\text{K}_2\text{B}_4\text{O}_7 + \text{B}_2\text{O}_3$ in the fused state. A. A. LEONTEVA (J. Phys. Chem. Russ., 1936, 8, 339—344).—The sp. vols. of mixtures containing 25, 45, 50, 55, 77, and 92 mol.-% B_2O_3 vary linearly with the temp. over the range $800\text{--}1250^{\circ}$. The isothermals afford indications of the existence of $\text{K}_2\text{O}, 3\text{B}_2\text{O}_3$ and $\text{K}_2\text{O}, 4\text{B}_2\text{O}_3$.

G. R.
B.p. relation of mixtures of ethyl alcohol and water beyond the azeotropic point. K. R. DIETRICH and H. GRASSMANN (Chem. Fabr., 1937, 10, 106—108).—Data have been obtained for the b.p. and composition of mixtures containing 90.2—100% EtOH. At 78.15° and 95.6% EtOH the vapour and liquid phases have the same composition. The distillation of aq. EtOH is discussed. R. S. B.

Volatility of fatty acids in aqueous solution. P. JAULMES and H. MAZARS (J. Chim. phys., 1937, 34, 37—45).—Coeffs. of distillation and volatility consts., X (cf. A., 1933, 770), have been determined at several temp., pressures, and concns. The ionisation consts. at 100° derived from vals. of X are: HCO_2H 1.2×10^{-4} , AcOH 1.2×10^{-5} , EtCO_2H 1×10^{-5} , $\text{Pr}^{\text{c}}\text{CO}_2\text{H}$ 3×10^{-6} , $\text{Bu}^{\text{c}}\text{CO}_2\text{H}$ 1.2×10^{-6} and $\text{Bu}^{\text{t}}\text{CO}_2\text{H}$ 8×10^{-6} . The separation of mixtures of fatty acids is discussed. J. G. A. G.

Stable unmixing in binary systems: salt + water. H. G. B. DE JONG and L. W. J. HOLLEMAN (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 69—71; cf. A., 1935, 1320).—The saturation curve for the (condensed) system novocaine dichromate (I)— H_2O has been determined. Crystals of (I) (m.p. 133°) melt under H_2O at 74° and form a separate liquid layer in equilibrium with a more dil. solution. The layers are completely miscible above 98° . Areas of limited miscibility also occur with novocaine perchlorate and thiocyanate. The phenomenon is discussed with reference to complex coacervation.

F. L. U.

Solubility. XV. Solubility of liquid and solid stannic iodide in silicon tetrachloride. J. H. HILDEBRAND and G. R. NEGISHI (J. Amer. Chem. Soc., 1937, 59, 339—341).—Data for the range 0 — 140° are recorded. The system is regular and shows no effects which could be ascribed to mol. forces.

E. S. H.

Solubility coefficients of cyclopropane for water, oils, and human blood. F. S. ORCUTT and M. H. SEEVERS (J. Pharm. Exp. Ther., 1937, 59, 206—210).—Solubility coeffs. of cyclopropane (I) are briefly discussed in relation to anæsthetic action of (I). The abs. solubilities as well as the oil— H_2O ratios of (I) for olive, cod-liver, and paraffin oils are approx. the same.

J. N. A.

Diffusion of colouring matter into artificially coloured phthalic acid crystals under the influence of heat. P. GAUBERT (Compt. rend., 1937, 204, 599—601).—Uniformly coloured crystals are obtained by adding colouring matter to the mother-liquor during crystallisation. On heating, the colouring matter separates as inclusions, and after cooling remains in the form of crystals with orientation similar to that of the $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$ crystals.

A. J. E. W.

Adsorption of gases and vapours by active carbon. W. C. BOKHAVEN and H. O. LOCKER (Chem. Weekblad, 1937, 34, 124—130).—A review dealing with the roles of absorption, chemisorption, adsorption, and capillary condensation in this phenomenon.

S. C.

Adsorptive properties of iron hydroxide. A. S. SCHACHOV (Kolloid. Shurn., 1936, 2, 215—223).—If, when $m_1 + m_2$ mols. of $\text{Fe}(\text{OH})_3$ are shaken with $C_1 + C_2$ mols. of aq. $\text{H}_2\text{C}_2\text{O}_4$, m_2 mols. of $\text{Fe}(\text{OH})_3$ are dissolved and C_2 mols. of $\text{H}_2\text{C}_2\text{O}_4$ are adsorbed, the fractions C_2/m_1 and m_2/C_1 are const. for a given gel.

J. J. B.

Adsorption of ions and physical character of precipitates. II. Ferric oxide and bentonite precipitates. G. E. CUNNINGHAM, H. E. GABLER, and W. S. PEACHIN (J. Physical Chem., 1936, 40, 1183—1189; cf. A., 1929, 390).—The sedimentation vols. of ppts. of hydrous Fe_2O_3 and of bentonite produced by different coagulating ions, and in presence of different stabilising ions, have been measured. The observed vols. are symbatic with the degree of hydration of the adsorbed ions.

F. L. U.

Sorption of gases by titania gel. III. Relation between the pressure and sorbed amount

of ammonia. I. HIGUTI (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 42—52; cf. A., 1936, 791).—Sorption and desorption isotherms have been determined at -50° to 40° . At 20 — 40° the curves agree with Freundlich's isotherm, but at lower temp. inflexion points and a hysteresis loop are observed. Results are discussed in reference to capillary-condensation, the mean pore radius at the beginning of the loop being 9.5 Å. (independent of temp.). Vols. of liquid adsorbate are approx. the same for equal pore radius, the max. val. being 0.36 c.c. per g. of gel. The differential heat of sorption in the high-pressure range is const. at 6070 g.-cal. per mol., which is approx. the latent heat of condensation of NH_3 at -40° , viz., 5670 g.-cal.

R. S. B.

Influence of the total volume of pores in silica gels on the adsorption of SO_2 . M. O. CHARMANDARIAN and E. L. KOPELOVITSCH (J. Phys. Chem. Russ., 1936, 8, 300—305).—Measurements have been made of the d and adsorptive capacity of SiO_2 gels prepared in various ways (cf. A., 1933, 1242). Addition of FeCl_3 increases the adsorptive capacity for SO_2 .

J. J. B.

Adsorption of alkalis by cellulose at different temperatures as a method of analysing the boundary between cellulose and solution. I. R. KLJATSKHO (Kolloid. Shurn., 1936, 2, 197—214).—Mercerised cotton reacts with NaOH eight times as fast as raw cotton. The interaction between cotton and NaOH may be explained either on the basis of adsorption or in terms of hydrolysis. The isotherms consist of several sections corresponding with different nos. of active spaces on the adsorbent surface. The temp. range examined was 15 — 45° .

J. J. B.

Mechanism of co-precipitation of anions by barium sulphate. F. SCHNEIDER and W. RIEMAN (J. Amer. Chem. Soc., 1937, 59, 354—357).—Differences between ppts. which are contaminated by occlusion and by mixed-crystal formation, respectively, are enumerated. In accordance with the principles formulated, it is shown that I^- , Br^- , Cl^- , NO_3^- , and ClO_3^- are occluded by BaSO_4 ppts., whilst NO_2^- is co-pptd. by mixed-crystal formation.

E. S. H.

Ideal adsorption isotherm. F. DURAU, H. KRÄCHTER, and K. KOOPMANN (Physikal. Z., 1937, 38, 157—158).—Data obtained for adsorption by PbCl_2 in the form of spheres and powder, the surface of which has been measured by the radioactivity method, can be used to derive the ideal adsorption isotherm. This is linear from the origin, but at a certain pressure becomes convex to the pressure axis and the slope increases more rapidly as the saturation limit is approached. The effect of lattice distortion caused by adsorption is discussed.

A. J. M.

Influence of magnetic field on adsorption. S. S. BHATNAGAR, P. L. KAPUR, and A. N. KAPUR (Phil. Mag., 1937, [vii], 23, 256—264).—The amount of KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, and $\text{K}_4\text{Fe}(\text{CN})_6$ adsorbed by sugar C is increased, and that of FeCl_3 decreased, by a strong magnetic field. The adsorption of KMnO_4 and $\text{K}_4\text{Fe}(\text{CN})_6$ by BaSO_4 is not affected. The theory of Burrage (A., 1933, 457, 898, 1112), according to

which adsorption by C is due to a complex C_xO_y on the surface, is applied to the above examples. MnO_2 , which is found in the filtrate after adsorption of $KMnO_4$, is ascribed to the interaction of $KMnO_4$ with C_xO_y . Similarly Cr^{III} is found in the system $K_2Cr_2O_7$ -C but $K_4Fe(CN)_6$ is partly oxidised to $K_3Fe(CN)_6$, so that the oxidising or reducing nature of C_xO_y depends on the nature of the adsorbate. The magnetic properties of C_xO_y are discussed and it is suggested that the magnetic field affects adsorption according to the rules deduced by Bhatnagar *et al.* (A., 1929, 1394). A. J. M.

Adsorption forces and their electrical nature. III. Nature of the forces of wetting. B. V. ILJIN, A. A. LEONTEEV, and S. V. BRAGIN (Phil. Mag., 1937, [vii], 23, 294—301).—The heat of wetting of KCl, KBr, and KI by CCl_4 , and of $BaSO_4$ by H_2O , EtOH, and CCl_4 has been determined for powders of varying degrees of fineness. The heat of wetting \propto sp. geometrical surface. The vals. in g.-cal. $\times 10^{-5}$ per sq. cm. of surface of the adsorbent are H_2O , 3.8; EtOH, 2; CCl_4 , 1.5. An approx. calculation, which takes account only of electrostatic forces, gives vals. of the same order as those obtained by experiment. A. J. M.

Desorptive action of radon. E. L. HARRINGTON and H. H. PENLEY (Physical Rev., 1935, [ii], 48, 473—474).—Adsorbed gases which are not easily removed by reduction of pressure are found to be released (or possibly formed) when Rn is admitted to the system. L. S. T.

Thermodynamics of spherical capillary layer of a pure substance. G. BAKKER (Z. physikal. Chem., 1937, 178, 193—213).—The capillary layer between a drop of a pure liquid and its vapour is considered. The thermodynamic potential of the capillary layer, defined as $u - Ts + p_T v$, where u is the total energy, s the entropy, and v the vol. of unit mass of the layer and p_T is the tangential pressure in it, may be shown to be equal to the thermodynamic potentials of the extended phases and to have similar properties. Confirmation has been obtained of the theory of the labile portion of the liquid-gas isotherm previously advanced (A., 1904, ii, 540). The max. capillary rise of a liquid occurs in a capillary of radius $\sim 2.5 \mu$, which is approx. equal to the pore radius of SiO_2 gel (A., 1914, ii, 632). R. C.

Theory of surface tension of Debye-Hückel electrolyte. K. ARIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 32—37).—Mathematical. A general σ formula is derived which accounts satisfactorily for the behaviour of aq. solutions of chlorides and sulphates. C. R. H.

Theory of surface tension of ternary solutions. K. ARIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 38—43).—Mathematical. Data for ternary solutions have been examined in relation to surface free energy attributable to interionic forces. C. R. H.

Osmotic coefficient and the activity coefficient at the surface. K. ARIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 44—51).—Mathematical. The coeffs. applicable to the surface of solutions of strong

electrolytes are calc. on the basis of the Debye-Hückel theory. C. R. H.

Linear or edge energy and tension as related to the energy of surface formation and of vaporisation. W. D. HARKINS (J. Chem. Physics, 1937, 5, 135—140).—The mol. energy associated with the edges of a lens of non-volatile oil on H_2O or of a crystal is considerable although only a small fraction of the total surface energy. It is of importance in many chemical phenomena and biological processes. W. R. A.

Surface salting-out by electrolytes. IV. Surface salting-out and temperature. V. K. SEMENT-SCHENKO and A. RUSTAMOV (J. Phys. Chem. Russ., 1936, 8, 383—386).—The surface tensions, σ , of $MgSO_4$ solutions (0—2 mols. per litre) have been measured at 0—60° in presence of 0—0.02 mols. per litre of *iso*- $C_5H_{11}OH$. Regions characterised by $d\sigma/dc = 0$ (c = concn. of electrolyte) previously (*ibid.*, 1935, 6, 45) detected in NaBr solutions are also found in the case of $MgSO_4$ solutions. These become narrower with rising temp. E. R.

Surface activity of ions. II. P. EKWALL (Acta Acad. Abo. math. phys., 1935, 8, No. 2, 11 pp.; Chem. Zentr., 1936, i, 2517).—The surface tension and the properties of the surface layer for aq. solutions of Me-, Et-, and Pr-substituted NH_4 picrate have been examined. H. J. E.

Heats of wetting of activated charcoal and silica. J. L. CULBERTSON and L. L. WINTER (J. Amer. Chem. Soc., 1937, 59, 308—310).—Data are recorded for wetting by H_2O , $PhNO_2$, C_6H_6 , CCl_4 , CS_2 , and light petroleum. The results are correlated with the apparent d of the solids in the same liquids (cf. this vol., 175). E. S. H.

Disperse hysteretic differential wetting. Kinetics of removal of adsorbed films as a method of investigating chemical reactions in the surface layer. I. R. KLJATSCHKO (Kolloid-Z., 1937, 78, 171—184; cf. A., 1936, 284).—Further data for the differential wetting of flat surfaces and powders of different minerals are presented. The adsorption films can be washed off the surfaces, irrespectively of whether the polar groups are attached to the surface or turned outwards. The results are discussed in reference to a quant. theory of flotation. F. L. U.

Mechanism of flotation. Adherence of particles to the boundary between two phases. Z. V. VOLKOVA (J. Phys. Chem. Russ., 1936, 8, 197—207).—The floating of loaded and unloaded glass, calcite, and barytes plates in the surface of H_2O has been measured and the results are compared with theory. J. J. B.

Adherence of bubbles to solid surfaces. V. S. VESELOVSKI and V. N. PERTZOV (J. Phys. Chem. Russ., 1936, 8, 245—259).—Along the line l of contact between solid, liquid, and air a tension exists which is similar to surface tension. It represents a force tending to decrease the perimeter of the bubble along l ; this force $\propto 1/\text{radius of curvature of } l$. The observed dependence of the contact angle on the radius agrees with this view. The friction involved in moving

bubbles on the surface, and the adherence of bubbles in aq. solutions to glass, mica, talc, graphite, Hg, and paraffin, were also measured. J. J. B.

Dielectric potential of a potassium chloride solution at different hydrogen-ion concentrations. B. KAMIENSKI and J. INGLOT (Bull. Acad. Polonaise, 1936, A, 255—257; cf. following abstract).—The dielectric potential V at the air-solution interface of 0.1*N*-KCl is const. at p_H from 1.8 to 12.2. V decreases at $p_H < 1.8$ and increases at $p_H > 12.2$. O. D. S.

Dielectric potential and surface tension of cholic acids at different hydrogen-ion concentrations. B. KAMIENSKI and J. INGLOT (Bull. Acad. Polonaise, 1936, A, 248—254; cf. A., 1936, 933).—The influence of $[H^+]$ from p_H 0.8 to 13 on the surface tension, σ , and on the dielectric potential, V , at the air-solution interface of solutions of dehydro-, deoxy-, and glyco-cholic acid in 0.1*N*-KCl is described. The changes in σ and in V are not \propto each other. Increase in $[H^+]$ causes a decrease in the abs. val. of V which is inconsistent with the hypothesis that the anion of the acid is adsorbed at the surface. O. D. S.

Influence of hydrogen ions on the dielectric potential and the surface tension of cinchonine and cinchonidine solutions. W. GOSLAWSKI (Bull. Acad. Polonaise, 1936, A, 370—377; cf. Kamienski, A., 1936, 933).—A parallelism is observed between the effects of $[H^+]$ on the surface tension and on the dielectric potential V at the air-solution interface of aq. solutions of cinchonine and cinchonidine hydrochlorides. Vals. of V in OAc' buffer solutions are $>$ in 0.1*M*-KCl solutions. O. D. S.

Built-up films of proteins and their properties. I. LANGMUIR, V. J. SCHAEFFER, and D. M. WRINCH (Science, 1937, 85, 76—80).—Unimol. layers of proteins can be transferred from a H_2O surface to one of Cr-plated brass covered by many layers of Ba stearate (I), and their thicknesses measured optically. The thickness of a film of ovalbumin obtained thus is approx. 2×10^{-7} cm. Multiple films containing > 30 layers can be built up, and single protein layers can be made to alternate with layers consisting of an even no. of stearate monolayers. Protein films are more impermeable to C_6H_6 , stearic acid, and the lower aliphatic hydrocarbons than are equally thick films of neutral (I). They are practically impervious to petrolatum mols. The effect of surface pressure on the thickness of protein films has also been studied. The properties of proteins are in accord with the view that the protein monolayer is a two-dimensional network held together by elastic forces, and not with a structure consisting of polypeptide chains. L. S. T.

Formation of hair-silver on charcoal surface. M. S. BELENKI (Kolloid. Shurn., 1936, 2, 225—227).—This occurs when active charcoal is added to $AgNO_3$ solution containing MeOH, EtOH, or C_3H_7OH . J. J. B.

Capillary systems. XVIII (1). New technique and apparatus for the preparation, characterisation, and use of membranes. E. MANEGOLD (Kolloid-Z., 1937, 78, 129—148; cf. A., 1935, 1200).—

A general description is given of methods and apparatus devised by the author. The characterisation of membranes by measuring their permeability to H_2O and gases, and by determining the vol. of their free spaces, is described in detail. F. L. U.

Change of molecular refraction of alcohol with concentration in benzene. P. TRATTEBA (Nuovo Cim., 1935, [ii], 12, 444—447; Chem. Zentr., 1936, i, 2731).—Mol. association appears to be without effect. H. N. R.

Determination of the mol. wt. of casein in phenol solutions. V. A. VILENSKI and T. L. KASTORSKAJA (Kolloid. Shurn., 1936, 2, 193—196).—Measurements of the osmotic pressure with a collodion membrane lead to a mol. wt. $> 25,000$. J. J. B.

Absorption spectrum of aqueous solutions between 0.70 and 0.90 μ . II. E. GANZ (Z. physikal. Chem., 1937, B, 35, 1—10; cf. A., 1936, 1179).—Solutions of alkali halides and alkaline-earth chlorides have been examined. In chloride solutions the displacement, Δ , of the H_2O band at 0.77 μ is approx. \propto the radius of the cation, and in solutions of bivalent cations is approx. twice as great as in solutions of univalent cations of the same normality. For K halide solutions Δ is independent of the radius of the anion. In general, the effect of dissolved ions on the solvent H_2O depends on their structure as well as on their size, a fact which supports the theory that liquid H_2O has a quasicryst. structure. Depolymerisation of the H_2O by the ions and ionic hydration tend to shift the above band in opposite directions; the predominating effect when both are present depends on the mol. state of the pure solvent at the particular temp. Reversal of the direction of Δ with rising temp. may be explained by depolymerisation of the H_2O rendering more single H_2O mols. available for hydration. R. C.

Estimation of drop-size in water clouds. N. FUCHS (Physikal. Z. Sovietunion, 1936, 10, 421—423).—The drops were collected on a glass plate covered with a mixture of vaseline and mineral oil (d 0.9). O. D. S.

Stabilisation of aerosols of ammonium chloride and mercuric iodide. K. N. SAMOCHVALOV and O. S. KOZUCHOVA (J. Phys. Chem. Russ., 1936, 8, 420—437).—The stabilisation and sensitisation of air suspensions of NH_4Cl and HgI_2 by H_2O , octyl alcohol, and I vapour have been examined by counting the particles deposited on a given surface, by measuring the diameter of the particles, and by microphotographic methods. Substances which act as stabilisers at low concns. may have a sensitising action at higher concns. The possibility of separating two substances (e.g., NH_4Cl and HgI_2) by means of the selective stabilisation of their suspensions is indicated. E. R.

Mechanical properties of foams. II. A. SIEHR (Kolloid-Z., 1937, 78, 156—158; cf. A., 1936, 1459).—The stability of foams of saponin is not affected by compression. They can, however, be destroyed by unilateral pressure causing distortion of the individual bubbles. F. L. U.

Study of disperse systems by methods of quantitative filtration analysis. V. A. POKROVSKI (Zavod. Lab., 1936, 5, 1164—1166).—Apparatus and methods are described. R. T.

Size and cataphoretic migration velocity of disperse particles. J. PROSZT (Mitt. berg-hüttenm. Abt. kgl. ung. Palatin.-Joseph-Univ. Sopron, 1935, 7, 26—32; Chem. Zentr., 1936, i, 2305).—For spherical particles of a paraffin emulsion, the cataphoretic velocity increases with size over the range 1—10 μ .

J. S. A.

Sedimentation volume, dilatancy, thixotropic and plastic properties of concentrated suspensions. H. FREUNDLICH and A. D. JONES (J. Physical Chem., 1936, 40, 1217—1236; cf. A., 1934, 487; 1935, 701).—The above-mentioned properties of conc. suspensions of 30 inorg. substances in H_2O , $N-HCl$, $N-NaOH$, and $N-NaCl$ have been examined. In all cases the diameter of the particles was 1—10 μ . The general rule that a small sedimentation vol., positive dilatancy, and absence of both thixotropy and plasticity are associated with close packing, and the converse properties with loose packing, is confirmed. Exceptions to the rule are recorded and discussed. The best criterion for judging the probable behaviour of a paste is the degree of independence of its particles. A high degree of independence, such as is shown by very hard substances (diamond, corundum, quartz), always leads to close packing. Markedly anisometric particles, especially when laminar (SnS_2 , graphite, mica), always give thixotropic pastes.

F. L. U.

Preparation and properties of highly concentrated sols. V. Stannic hydroxide sols. N. R. DHAR and C. I. VARADANAM (J. Indian Chem. Soc., 1936, 13, 602—608; cf. A., 1935, 820).—Sols containing up to 9.8% of SnO_2 have been prepared by peptising well washed freshly pptd. hydrous SnO_2 with conc. aq. NH_3 and evaporating on a water-bath. The sols yield jellies when concentrated further or when treated with HCl , KCl , or $BaCl_2$. The η is only about 50% > that of H_2O . The sols become less stable to electrolytes on dialysis. Electrical conductivities are given.

F. L. U.

Particle size and optical properties of emulsions. E. D. BAILEY, J. B. NICHOLS, and E. O. KRAEMER (J. Physical Chem., 1936, 40, 1149—1155).—A method is described for calculating, by means of a mechanical product-integrator, the relation between the optical absorption coeff. of a colourless emulsion and the radius of the particles, from a series of "wt.-optical" distribution curves. The latter are determined with a Svedberg low-speed ultracentrifuge, using a series of Nujol-aq. glycerol emulsions in which the refractive index of the aq. phase is varied. A generalised curve is given to show the relation between the absorption coeff. and the concn., particle size, n vals. of the phases, and λ .

F. L. U.

Ultrafiltration through Cellophane of porosity adjusted between colloidal and molecular dimensions. J. W. MCBAIN and R. F. STUEWER (J. Physical Chem., 1936, 40, 1157—1168).—In order to make sheet cellulose as now manufactured freely permeable to ordinary mols. it must be soaked in aq.

$ZnCl_2$ of 63—65 wt.-% concn. Donnan effects are observed in the ultrafiltration of very dil. electrolytes. The previously reported (A., 1931, 303) presence of colloid in aq. $NaIO_3$ and KIO_3 is now shown to have been erroneous. CdI_2 is, however, retained by a membrane to a greater extent in conc. than in dil. solutions. The influence of pressure and rate of stirring on the retention of sucrose has been determined.

F. L. U.

Thixotropy. I. Method for measuring particle-size distribution in colloidal systems. E. A. HAUSER and C. E. REED (J. Physical Chem., 1936, 40, 1169—1182).—With a view of studying the influence of particle size on the thixotropic sol-gel transformation, a laboratory supercentrifuge of the Sharples type has been used to obtain the distribution function. The theory of the machine is worked out and applied to the data obtained by fractionating a suspension of bentonite.

F. L. U.

Action of pectic substances on sugars. T. K. GAPONENKOV and V. N. MIMRIKOVA (Kolloid. Shurn., 1936, 2, 243—246).—Diffusion of sucrose, glucose, and fructose through a collodion membrane is found to be retarded by the presence of pectic substances.

Preparation of colloidal gold by the Borowskaya process. Results in neuro-syphilis. A. PRUNELL (Compt. rend. Soc. Biol., 1937, 124, 594—596).—The Borowskaya process (reduction of aq. $AuCl_3$ by Na citrate) is simpler and more trustworthy than that of Lange.

H. G. R.

Highly purified chromic hydroxide sol. G. MILAZZO and W. PAULI (Kolloid-Z., 1937, 78, 158—164; cf. A., 1936, 1200).—The prep. and behaviour of a sol containing 0.1 mol. of Cr per litre are described. The sol, which is highly sensitive, is coagulated at unusually low electrolyte concns., viz., KCl 8, Na_2SO_4 0.3, $K_2Fe(CN)_6$ 0.29, $K_4Fe(CN)_6$ 0.1 millimol. per litre. Unlike $Fe(OH)_3$, the sol is stable when heated to $>200^\circ$. Analysis shows the neutral part of the colloid to consist of $Cr(OH)_3 \cdot 2H_2O$, and it is probable that the stabilising ion is $Cr(OH)_2^+$.

F. L. U.

Peptisation of ferric hydroxide in quaternary ammonium bases and the behaviour of different ferric oxide sols towards alkaline solutions of polyhydroxy-compounds. K. E. STUMPF (Kolloid-Z., 1937, 78, 193—200; cf. A., 1935, 1073).— $Fe(OH)_3$ is dissolved by aq. $OH \cdot CH_2 \cdot CH(OH) \cdot CH_2 \cdot NMe_3 \cdot OH$ to the extent of 1.24 mol. Fe per litre, and to a greater extent by $[CH(OH)]_4(CH_2 \cdot NMe_3 \cdot OH)_2$. Complex formation occurs in both cases, but is with $Cu(OH)_2$. Part of the $Fe(OH)_3$ is peptised by the base and can be separated from the complex compound by dialysis, in the course of which it is coagulated. Addition of $NaOH$ to the base increases the proportion of Fe in true solution, owing to the formation of "zwitter-ions," e.g., $OH \cdot CH_2 \cdot CH(OH) \cdot CH_2 \cdot NMe_3^+ + OH^-$ $OH \cdot CH_2 \cdot CHO \cdot CH_2 \cdot NMe_3^+ + H_2O$.

F. L. U.

Binding of water in ferric hydroxide and aluminium hydroxide sols. E. SCHURIGINA (Kolloid. Shurn., 1936, 2, 55—59).—Refractometric determination of bound H_2O in the sols indicates that

they may be classified as lyophilic colloids. Ageing of the sols and rise in temp. lead to diminution in the bound H_2O content, but transition to a thixotropic gel, or the reverse process, does not affect the bound H_2O . Parallel results are obtained by viscosimetric and refractometric observations. R. T.

Direct examination of sols by X-ray diffraction methods. W. O. MILLIGAN and H. B. WEISER (J. Physical Chem., 1936, 40, 1095—1102; cf. A., 1936, 287).—An arrangement for obtaining X-ray diagrams of particles in an unenclosed flowing column of sol is described. The method has been used to study sols of hydrous oxides, Ag, Argyrol, and AgI. In agreement with previous studies of moist gels, the particles are found to consist in general of simple compounds and not complexes. F. L. U.

[Refraction of light by colloidal solutions.] M. KATALINIĆ (Kolloid-Z., 1937, 78, 191—193).—The conclusion of Menon (A., 1936, 1067) regarding the applicability of Rayleigh's formula is erroneous, owing to his omission of the $\sin \theta$ correction.

F. L. U.
Refraction of light by colloidal solutions. II. Sols of copper, cupric hydroxide, and mercuric sulphide. A. S. MENON (Kolloid-Z., 1937, 78, 185—191; cf. A., 1936, 1067).—The polarisation max. is at right angles to the direction of the incident light in all three sols. Rayleigh's equation is valid for sols having particles with radius $<115 m\mu$, and for sols during the initial stages of coagulation. The time-intensity curve during coagulation is S-shaped, indicating an auto-catalytic effect. F. L. U.

Dispersion of depolarisation of light-scattering in colloids. I. Gold sols. R. S. KRISHNAN (Proc. Indian Acad. Sci., 1937, 5, A, 94—107).—Measurements of the dispersion of depolarisation and of the extinction coeffs. have been made for six Au sols with λ range 2500—7000 Å. The optical anisotropy of the particles is relatively low in the shorter λ region and higher in the green region where absorption is a max. Polarisation data and extinction coeffs. are compared with those calc. on Gans' theory, and indicate that the particles behave optically like elongated ellipsoids of approx. axial ratio 0.75. N. M. B.

Spectral transformations undergone by solutions of colouring matter under the influence of another dissolved substance. A. BOUTARIC (J. Chim. phys., 1937, 34, 1—17).—Theoretical. Equations connecting changes of concn. with changes of optical absorption are developed. There is only partial accord with the data of Vles (A., 1928, 14, 36) and the origin of the anomalies is discussed. J. G. A. G.

Effect of departure from spherical shape on the viscosity caused by colloidal particles and large molecules. J. W. MCBAIN and M. E. L. MCBAIN (J. Amer. Chem. Soc., 1937, 59, 342—344).—When a sphere is elongated to a fibre 2500 times as long as its diameter, the resistance to movement is too low to explain the high η of sols such as cellulose nitrate. The chief factor determining the high η of such sols is probably structural η due to entanglement and local adherence of mols. and

particles immobilising a relatively large amount of solvent. E. S. H.

Conductivity and cataphoretic speed measurements of colloidal Prussian-blue and arsenious sulphide from the viewpoint of origin of charge on colloidal particles. G. F. MANKODI, C. B. JOSHI, P. M. BARVE, and B. N. DESAI (J. Univ. Bombay, 1936, 5, Part II, 53—61).—Observations on the influence of dilution, dialysis, ageing, and exposure to sunlight on the conductivity and electrophoresis of the sols support the view that the charge on the particles is due to preferential adsorption of ions of the electrolytes in the sol, rather than to dissociation of ionogenic complexes at the surface of the particles. E. S. H.

Influence of ionic flow on the stability and coagulation of colloidal systems. E. I. SOLOVIEV (Kolloid. Shurn., 1936, 2, 149—155).—Bubbling of ionised air through sols does not affect their stability. Dropping of sols through ionised air gives irregular results. J. J. B.

Variations in the electrophoretic behaviour of gelatin-protected silver halide sols. L. F. TICE and W. G. BATT (Amer. J. Pharm., 1937, 109, 29—35).—The addition of gelatin prepared from material which has had a preliminary liming treatment to a AgI hydrosol confers a negative charge at any $p_H > 4.8$ (isoelectric point) and gelatin which has had an acid pretreatment confers a positive charge at $p_H < 7.5$ (isoelectric point), both irrespective of the initial charge of the hydrosol. As a consequence of the different isoelectric points of the two types of gelatin, mutual flocculation occurs when their solutions are mixed so that the p_H falls within the limits 4.8 and 7.5. E. H. S.

Multiple emulsions and spontaneous formation of emulsion systems. F. M. SCHEMJAKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 23—26).—Observations on the system PhMe-gelatin- H_2O are recorded and the formation of $CHCl_3$ emulsions by allowing KOH to diffuse into gelatin or agar gel containing chloral hydrate has been investigated. J. G. A. G.

General theory of lyophobic colloids. II. H. C. HAMAKER (Rec. trav. chim., 1937, 56, 3—25; cf. this vol., 78). A. J. E. W.

Structure viscosity and properties of solutions of cellulose esters. II. Influence of ash content of cellulose nitrate on the viscosity of collodion solutions. S. ROGOVIN and M. SCHLACHOVER (Kolloid-Z., 1937, 78, 224—230; cf. A., 1935, 1074).—Addition of $Ca(OH)_2$ to cellulose nitrate has no effect on the η of dil. (0.25%) sols in EtOH-Et₂O or $COMe_2$, but markedly increases that of conc. (2—16%) sols. Treatment with HCl produces the reverse effect, again observable only with conc. sols. The results are consistent with the view that a compound with $Ca(OH)_2$ is formed whereby the degree of aggregation is increased, and that the action of HCl is due to the destruction of the compound. F. L. U.

Hydrophilic properties of cellulose. IV. Damp-proof Cellophane. I. Sorption isotherms

for mercerised cellulose treated with solutions of salts with multivalent cations. K. KANAMARU and T. NAKAMURA. V. Damp-proof Cellophane. II. Regeneration of cellulose from viscose in an electrically neutral state. K. KANAMARU and Y. FUKUHARA (Kolloid-Z., 1937, 78, 209—218, 218—224; cf. this vol., 133).—IV. Sorption isotherms of H_2O vapour on viscose threads and Cellophane sheets have been determined after treatment with aq. AlCl_3 , ThCl_4 , $\text{Th}(\text{NO}_3)_4$, and TiCl_4 . Except with TiCl_4 , the hygroscopicity decreases parallel with the ζ -potential and attains a min. at $\zeta = 0$, after which it again increases as ζ becomes more positive. With TiCl_4 hygroscopicity is reduced to a smaller extent, and no reversal of charge occurs.

V. Viscose sols spun into a bath containing $\text{Al}_2(\text{SO}_4)_3$ yield filaments, the ζ -potential of which, and the properties associated with it, vary with the Al salt concn. in the manner indicated above. Extensibility and fineness are at a min. at $\zeta = 0$, whilst the tensile strength continues to increase, although very slowly, after the charge is reversed. The degree of impermeability to H_2O of electrically neutral cellulose regenerated from viscose sols is approx. the same as that of commercial waterproof Cellophane. F. L. U.

Emeraldin sols. IV. Dependence of the stabilising capacity of gelatin on acidity of the solution in the oxidation of aniline. V. PTSCHELIN (Kolloid-Z., 1937, 78, 204—209; cf. this vol., 133).—In the formation of emeraldin sols by the oxidation of aq. NH_2Ph , HCl with CrO_3 in presence of varying amounts of HCl gelatin has a stabilising influence at low and a sensitising (coagulating) action at higher concns. of HCl . F. L. U.

Molecular properties of lignin solutions from viscosity, osmotic pressure, b.p. elevation, diffusion, and spreading measurements. D. L. LOUGHBOROUGH and A. J. STAMM (J. Physical Chem., 1936, 40, 1113—1132).—Lignin, prepared from maple and spruce by three different methods, gives a mol. wt. 3900 ± 300 by the osmotic pressure and ebullioscopic methods, and $10,000 \pm 1000$ by diffusion measurements. The vals. obtained are independent of the method of prep. and of the solvent (MeOH , EtOH , COMe_2 , CHCl_3), and viscosity measurements indicate that the solutions are approx. unidisperse. It is therefore inferred that the true mol. wt. is about 3900 and that the higher val. is due to the non-sphericity of the mols. Spreading measurements, on H_2O and 0.1N- HCl , give a mol. area of 318 sq. A., and a shape of the order $3 \times 16 \times 100$ A. F. L. U.

Emulsions. Regions of heterogeneity in the system sodium oleate, phenol, xylene, and water, and in binary systems of these components. J. WEICHERTZ and N. PLETENEVA (Kolloid. Shurn., 1936, 2, 133—148).—The systems investigated are PhOH -xylene- H_2O , Na oleate- PhOH , and PhOH -Na oleate- H_2O . J. J. B.

Numerical definition of lyotropic series of univalent cations. A. VOET (Kolloid-Z., 1937, 78, 201—204).—The lyotropic properties of the alkali-metal ions, with respect to their coagulating action on a hydrophobic sol, can be expressed as nos.

which bear a linear relation to the coagulating val., defined as the concn. at which the no. of particles is reduced in a given time to a specified fraction of the original. F. L. U.

Structure of silicic acid gels. A. V. KISELEV (Kolloid. Shurn., 1936, 2, 17—25).—The H_2O content and heat of wetting of SiO_2 gel (I) fall, and the heat of wetting per g. of H_2O rises, as the temp. of preheating of (I) increases from 120° to 1100° . The sp. active surface of (I) prepared at 260° from SiCl_4 amounts to 10^6 sq. cm.; the amount of H_2O adsorbed at saturation corresponds with saturation of the surface with OH groups. Prolonged heating of (I) at 1100° does not appreciably affect its crystal structure. R. T.

Movement of crystalline iodine in silica gel. M. A. MILLER (J. Chem. Educ., 1936, 13, 532—533).—Deposition of cryst. I in SiO_2 gel may be periodic or non-periodic and depends on the rate of diffusion of the entering reagent, e.g., K_2CrO_7 or KMnO_4 and H_2SO_4 , HNO_3 , Cl_2 , or $\text{Br-H}_2\text{O}$, and also on the nature of the reaction. Crystallisation occurs in the rear of the diffusion front, and the movement of I crystals in SiO_2 gel appears to be the result of re-dissolution at the rear of the crystal mass and deposition at the crystal front. L. S. T.

Magnesium hydroxide formation in gelatin. F. M. SCHEMJAKIN and A. I. LAZAREVA (Compt. rend. Acad. Sci. U.S.S.R., 1936, 4, 369—372; cf. A., 1936, 29).—Further observations on the formation of periodic structures in the interaction of MgCl_2 and aq. NH_3 are recorded. J. G. A. G.

Refraction law in periodic precipitates. V. K. NIKIFOROV and A. P. RUNTZO (Kolloid. Shurn., 1936, 2, 229—238).—When two agar gels of different concns., both containing KI, are in contact along a straight boundary and a drop of aq. $\text{Pb}(\text{NO}_3)_2$ is added it is found that the directions of propagation of rings are different in the two gels. If α_1 and α_2 be the angles formed by these directions and the perpendicular to the boundary, the relative velocities of ring propagation in the gels (v_1 and v_2) are connected by $\sin \alpha_1 / \sin \alpha_2 = v_2 / v_1$. J. J. B.

Mechanism of gelation of the system pectin, sugar, and acid. T. K. GAPONENKOV (Kolloid. Shurn., 1936, 2, 239—242).—The rigidity of gels formed by interaction of pectin, sucrose, and tartaric acid has been investigated. Greater rigidity is produced by pectins having a high capacity for binding H_2O . J. J. B.

Influence of salts on gelation in the system pectin-sugar-acid. T. K. GAPONENKOV and V. N. MIMRIKOVA (Kolloid. Shurn., 1936, 2, 47—50).—The effect of adding K, Na, Mg, Ca, Ba, and Al chlorides on the rigidity of the gels formed in the system apple pectin-sucrose-tartaric acid has been studied. R. T.

Spreading of urease and Bence-Jones protein. E. GORTER and L. MAASKANT (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 73—76; cf. following abstract).—Area- p_{H} curves of both proteins show max. at a p_{H} which independent methods indicate as the isoelectric point. The abs. val. of the area is greatly influenced by time. F. L. U.

Spreading of protamine insulinate. E. GORTER and L. MAASKANT (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 71—73; cf. A., 1935, 161).—An insulin-clupein complex, as also a special prep., "Leo Insulin Retard," differ from uncombined insulin in that the area per mg.- p_H curves for the former show no min. on the alkaline side. F. L. U.

Hydration of gum arabic and glycogen. H. B. OAKLEY (Biochem. J., 1937, 31, 28—34).—The degrees of hydration of Na- and Ca-gum arabic and of glycogen, calc. from the distribution of an indifferent reference substance (COMe₂) between 10% solutions of the colloids and H₂O across a membrane, are respectively, 1.1 ± 0.05 , 0.9 ± 0.05 , 0.27 ± 0.05 g. H₂O per g. of colloid. The COMe₂ was determined analytically, and in the concn. range used ($M=0.002M$) the calc. hydration is const. within the experimental error. The diameter of a gum arabic particle of "mol. wt." 240,000 (A., 1936, 1200), assumed spherical, is 11 m μ . F. L. U.

Coacervation of amylophosphoric acid and proteins. P. KOETS (J. Physical Chem., 1936, 40, 1191—1200).—Amylophosphoric acid (P₂O₅ 0.5%), unlike amylose, yields complex coacervates with gelatin, leucosin, and potato albumin, when the p_H is < that of the isoelectric point of the protein. Curves showing the viscosity of the respective mixtures at different p_H vals. and with varying proportions of the constituents are given. Reasons are adduced for regarding amylopectin as itself a complex coacervate. F. L. U.

"Hydrophoby" of the hair.—See A., III, 119.

Thermodynamic treatment of systems, particularly solutions, from the point of view of activity and related functions. R. W. GORANSON (J. Chem. Physics, 1937, 5, 107—112).—The bearing of activity conceptions on the thermodynamics of solutions and gas mixtures is discussed with special reference to dissociated and undissociated components. W. R. A.

Thermodynamic treatment of chemical equilibria in systems composed of real gases and its application to the ammonia equilibrium. G. SEMERANO (Mem. R. Accad. Italia, 1936, 7, 61—79).—A survey of thermodynamic methods. For the NH₃ equilibrium the experimental results are best represented by the formula of Gillespie and Beattie (A., 1930, 1508) over the whole pressure range. O. J. W.

Dissociation constants of ascorbic acid. J. C. GHOSH and P. C. RAKSHIT (Biochem. Z., 1937, 289, 395—396; cf. Birch and Harris, A., 1933, 646; Karrer *et al.*, A., 1934, 564).—Conductometric data for Na ascorbate show that the first and second dissociation consts. for ascorbic acid are 6.3×10^{-5} and 2.7×10^{-12} , respectively. Vals. of p_K and p_{K_2} at 29° are 4.20 and 11.57, respectively. W. McC.

Dissociation constants of diaquotetramminecobaltic cation as an acid. A. B. LAMB and E. B. DAMON (J. Amer. Chem. Soc., 1937, 59, 383—390).—Concordant vals. can be obtained by measuring with the glass electrode the $[H^+]$ in solutions of $[Co(NH_3)_4(H_2O)_2]^{3+}$ to which various amounts of

NaOH have been added. The velocity of decomp. of $[Co(NH_3)_4(H_2O)_2]^{3+}$ in these solutions \propto the concn. of $[Co(NH_3)_4(OH)_2]$ in equilibrium with it. E. S. H.

One-third basic aluminium acetate. II. Degree of hydrolysis and activities of hydrogen and acetate ions in relation to concentration and temperature. C. ROHMANN and W. MIRS (Arch. Pharm., 1937, 275, 103—113; cf. A., 1933, 569).—The degree of dissociation of aq. $Al(OAc)_3 \cdot OH$ has been shown to depend on the concn. and temp. by ascertaining the composition of the Et_2O -AcOH solution with which it is in equilibrium. The influence of temp. is greater in the more conc. solutions. The $[H^+]$ would be expected from the degree of dissociation and the solution is an excellent buffer; its p_H renders it very suitable for medicinal purposes, being close to the optimum for many proteins. R. S. C.

X-Ray determinations of structure of some complex ions in solutions of electrolytes. V. DANLOV, V. FINKELSTEIN, and M. LEVASCHEVITSCH (Physikal. Z. Sovietunion, 1936, 10, 223—230).—Observations have been made on aq. solutions of K_2ZnI_4 , ZnI_2 , and K_2HgI_4 . In consequence of the high at. no. of I these solutions scatter X-rays in the same way as gases. The intensity curves agree with those calc. on the assumption that HgI_4^{2-} and ZnI_4^{2-} are tetrahedral and the curve for ZnI_2 solutions indicates the presence of ZnI_4^{2-} . The Hg—I distance in HgI_4^{2-} is 3.04 Å., and the Zn—I distance in ZnI_4^{2-} is 2.82 Å. A. J. M.

Uninuclear tripropylenediaminechromic ion, binuclear tripropylenediaminecobaltic ion, and their sulphato-, oxalato-, phosphato- and arsenato-complexes. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1937, 230, 416—418).—Determinations of ion-wt. by diffusion experiments show the existence of the ions: $[Cr\{C_3H_6(NH_2)_3\}_3]^{3+}$, $[Cr\{C_3H_6(NH_2)_2X\}_3]^{5-}$, $[Co_2\{C_3H_6(NH_2)_2\}_6]^{6+}$, and $[Co_2\{C_3H_6(NH_2)_2\}_6X_4]^{2-}$, where $X = SO_4$, C_2O_4 , HPO_4 , or $HAsO_4$. E. S. H.

B.p.-composition diagram for dilute aqueous solutions of deuterium oxide. E. R. SMITH and M. WOJCIECHOWSKI (J. Res. Nat. Bur. Stand., 1936, 17, 841—848).—For 0.3—7% aq. solutions of D₂O the elevation in b.p. (ΔT) is given by mol.-% D₂O = $70.9\Delta T$. The calc. ratio $[D_2O/H_2O]_{liquid}/[D_2O/H_2O]_{vapour}$ varies between 1.13 and 1.03 for 0.01—0.07 mol. fraction of D₂O. R. S. B.

Kinetic and thermodynamic activity of protons and deuterons in water-deuterium oxide mixtures. W. J. C. ORR and J. A. V. BUTLER (J.C.S., 1937, 330—335; cf. A., 1936, 1346).—Rates of hydrolysis of acetal in H₂O(HCl)-D₂O(DCl) mixtures, and in H₂O-D₂O solutions of half-neutralised HCO₂H, have been determined. On the assumption that the activity coeffs. do not vary with the composition of the solvent the relative dissociation consts. of HCO₂H can be obtained and a function which expresses the variation of the thermodynamic activity of protons and deuterons with the composition of the water is calc. The rates of hydrolysis of acetal in HCl-DCl solutions are shown to be expressible by the same

function, and must therefore be determined by the thermodynamic proton and deutron activities of the solutions. It would seem therefore that the hydrolysis of acetal is an example of sp. H-ion catalysis.

F. L. U.

Relative atomic weight of oxygen from air and water determined by an interchange reaction. T. O. JONES and N. F. HALL (J. Amer. Chem. Soc., 1937, 59, 259—261).—Exchange equilibrium between H_2O vapour and O_2 is established rapidly on a hot wire at $\approx 1800^\circ$ abs., but much more slowly at lower temp. The d of H_2O , thus equilibrated with excess of air, increases by about 7 p.p.m.; the Dole effect is confirmed. The procedure may be used to prepare H_2O having a high d due to isotopic O.

E. S. H.

Equilibrium between nitric oxide, nitrogen peroxide, and aqueous solutions of nitric acid. F. S. CHAMBERS, jun., and T. K. SHERWOOD (J. Amer. Chem. Soc., 1937, 59, 316—319).—Equilibrium in the reaction $3\text{NO}_2 + \text{H}_2\text{O} \rightleftharpoons 2\text{HNO}_3 + \text{NO}$ has been studied at 25° for 37—59% HNO_3 and at 15— 35° for 54—55% HNO_3 . The results, considered with reference to $K_1 - (P_{\text{NO}})/(F_{\text{NO}})^3$, agree with the data of Abel, Schmid, and Stein (A., 1930, 1370), but not with those of Burdick and Freed (A., 1921, ii, 313).

E. S. H.

Chemistry of oxygen. R. SCHENCK (XIV Congr. Chim. ind., 1935, Comm. 2, 6 pp.; Chem. Zentr., 1936, i, 2518).—A discussion of the oxygen pressure over metallic oxides and of the effect of added substances.

H. J. E.

Dissociation of lithium nitrate. M. CENTNERS-ZWER and M. BLUMENTHAL (Bull. Acad. Polonaise, 1936, A, 470—481).— LiNO_3 dissociates reversibly above its m.p. into LiNO_2 and O_2 . Dissociation pressures are recorded from 355° to 435° ; the calc. heat of dissociation is $-12,545$ g.-cal. per mol.

J. S. A.

Dissociation of silver nitrate. M. CENTNERS-ZWER and M. BLUMENTHAL (Bull. Acad. Polonaise, 1936, A, 482—492).—The gas mixture $2\text{NO}_2 + \text{O}_2$ reacts with "mol." Ag at 100° , forming AgNO_3 . It thus appears that the dissociation of AgNO_3 is reversible, and dissociation pressures are recorded between 248° and 290° . The calc. heat of dissociation is $-32,750$ g.-cal.

J. S. A.

Systems of sulphur dioxide and the isomeric xylenes. W. F. SEYER, K. MARTIN, and L. HODNETT (J. Amer. Chem. Soc., 1937, 59, 362—363).—F.-p. data for mixtures of SO_2 with *o*-, *m*-, and *p*-xylene, respectively, are recorded. No compounds are formed. Comparison of the calc. latent heats of fusion with experimental vals. shows that the *m*- and *p*-solutions deviate from ideal mixtures.

E. S. H.

Potassium hydrogen sulphate. H. HAGISAWA and T. TAKAI (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 29—41).—The eutectic mixture of KHSO_4 (I) and $\text{K}_2\text{S}_2\text{O}_7$ (II) has m.p. 203.5° and a mol. ratio (I)/(II) of 9/1; the m.p. of (I) and (II) are 211.7° and 413.7° , respectively. The solubility of (I) in conc. H_2SO_4 has been determined at 135 — 200° ; transition points of (I) are shown at 164.2° and 184° .

The rate of dissociation of (I) increases much more in the interval 300 — 350° than in 350 — 400° , and the reaction is bimol., corresponding with $2(\text{I}) = (\text{II}) + \text{H}_2\text{O}$. The dissociation pressure of (I) at 140 — 210° is given by $\log p_{\text{mm.}} = -3965.60/T + 9.36683$.

R. S. B.

Alkali phosphates and arsenates. II. Tertiary sodium phosphate. H. MENZEL and E. VON SAHR [with W. HAGEN] (Z. Elektrochem., 1937, 43, 104—119; cf. A., 1932, 582).—A real $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ (denoted *o*- $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$) (I) does not exist in equilibrium with aq. solutions. A series of homogeneous solid phases of varying composition occurs in the system $\text{Na}_2\text{O}-\text{P}_2\text{O}_5-\text{H}_2\text{O}$ at 20° , near the transition point of secondary and tertiary phosphate. With increasing $\text{Na}_2\text{O}:\text{P}_2\text{O}_5$ ratio in the solution the $\text{Na}_2\text{O}:\text{P}_2\text{O}_5$ ratio in the solid phase increases rapidly to 3.20:1 and then approaches asymptotically a limit of 3.25:1. These solid phases are denoted ψ - $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ (II). (II) exists over the range 0 — 50° and in solutions containing $>26\%$ Na_2O . The solid phase in equilibrium with solutions containing 26—31% Na_2O is *o*- $\text{Na}_3\text{PO}_4 \cdot 6\text{H}_2\text{O}$ (III), and with $>31\%$ Na_2O is *o*- $\text{Na}_3\text{PO}_4 \cdot 0.5\text{H}_2\text{O}$ (IV). When heated, (II) passes reversibly through ψ - $\text{Na}_3\text{PO}_4 \cdot 8\text{H}_2\text{O}$ to ψ - $\text{Na}_3\text{PO}_4 \cdot 0.5\text{H}_2\text{O}$. The latter is similar in structure to (IV), but does not give up all its H_2O on heating at 150 — 800° . The residue has a similar structure to *o*- Na_3PO_4 (V). The residual H_2O can be removed only by raising to a very high temp. and vaporising the excess of Na_2O . Above 75° , (III) is the stable solid phase in the system $\text{Na}_2\text{O}-\text{P}_2\text{O}_5-\text{H}_2\text{O}$. *o*- $\text{Na}_3\text{PO}_4 \cdot 8\text{H}_2\text{O}$ (VI) has, at the most, a very narrow range of stability in contact with solution. Above 100° , the stable phase is (IV), which dehydrates completely to (V). On absorption of H_2O , (IV) yields (III), (VI), and finally (I), of similar crystal structure to (II).

J. W. S.

Reduction equilibria of titanium dioxide by hydrogen. N. NASU (Sci. Rep. Tohoku, 1936, 25, 510—526).—Using a new gas circulation pump (involving entrainment of gas bubbles between mercury droplets passing through a narrow tube) and a new method of analysing H_2 - H_2O mixtures (measurement with a McLeod gauge at ordinary temp. and in liquid N_2), the equilibrium TiO_2-H_2 - $\text{Ti}_2\text{O}_3-\text{H}_2\text{O}$ has been investigated at 1022 — 1280° abs. The equilibrium const. K_p is given by $\log K_p = 1.9305 - 2.754/T$. The vals. of ΔH , ΔF , and ΔS are deduced for several reactions. The lattice energy of Ti_2O_3 calc. by the Born-Haber thermodynamical cycle is 3569.51 kg.-cal. per g.-mol., a little $>$ the theoretical val.

J. W. S.

Oxidation equilibrium of magnesium chloride by water vapour. K. SANO (Sci. Rep. Tohoku, 1936, 25, 745—754).—The equilibrium $\text{MgCl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{MgO} + 2\text{HCl}$ has been studied statically at 525 — 621° . Equilibrium consts. for the reactions $\text{MgO} + \text{C} + \text{Cl}_2 \rightleftharpoons \text{MgCl}_2 + \text{CO}$ and $\text{MgO} + \text{CO} + \text{Cl}_2 \rightleftharpoons \text{MgCl}_2 + \text{CO}_2$ are calc. The entropy of MgCl_2 at 298° abs. = 28.96 e.u.

H. J. E.

Equilibrium reaction of water vapour with several metallic fluorides at high temperatures. L. DOMANGE (Ann. Chim., 1937, [xi], 7, 225—297).—

The reaction between H_2O vapour and fluorides at high temp. has been followed by passing the vapour at known rates over the fluoride and determining the liberated HF. Extrapolation to zero rate of flow enables the equilibrium conditions at const. pressure to be determined. From the equilibrium consts. the following vals. have been calc. for Q in the equations of the type $\text{MF}_2 + \text{H}_2\text{O} \rightleftharpoons 2\text{HF} + \text{MO} + Q$ (M = bivalent metal): CuF_2 , $-25,200$; MgF_2 , $-44,300$; CaF_2 , $-48,500$; BaF_2 , $-37,250$; ZnF_2 , $-25,800$; CdF_2 , $-28,450$; PbF_2 , $-37,200$; CrF_3 , $-66,500$; FeF_3 , $-61,300$; CoF_2 , $-29,850$; NiF_2 , $-30,500$ g.-cal. The calc. chemical const. for HF is 2.6. The calc. heats of formation of anhyd. fluorides compare favourably with recorded vals. C. R. H.

Equilibrium constant of the reaction between barium oxalate and sulphate ion. N. A. TANANAEV and A. T. PILIPENKO (Zavod. Lab., 1936, 5, 1161—1164).—The equilibrium in the reaction $\text{BaC}_2\text{O}_4 + \text{Na}_2\text{SO}_4 \rightleftharpoons \text{Na}_2\text{C}_2\text{O}_4 + \text{BaSO}_4$ corresponds with 99.94% formation of BaSO_4 . SO_4^{2-} may be determined as BaSO_4 in 0.2*N*-acid solution in presence of $>0.1N$ -oxalate and $>0.01M$ - BaCl_2 . R. T.

Melting of danburite: liquid immiscibility in the system, $\text{CaO}-\text{B}_2\text{O}_3-\text{SiO}_2$. G. W. MOREY and E. INGERSON (Amer. Min., 1937, 22, 37—47).—Phase equilibrium data in and near the region of immiscibility are recorded. The composition of danburite (I) falls within this region. (I) is unaffected by heat up to 996° when sintering begins. After several days at 1002° , it is decomposed with the formation of two layers. It can be synthesised by hydrothermal means, but not by heat-treatment below the melting temp. L. S. T.

The section $\text{CaO}, \text{SiO}_2-\text{MnO}, \text{SiO}_2$ in the ternary system $\text{SiO}_2-\text{CaO}-\text{MnO}$. E. VOOS (Veroff. Kaiser Wilh.-Inst. Silikat-Forsch., 1935, 7, 65—81; Chem. Zentr., 1936, i, 2722).—A continuous series of mixed crystals is formed by $\beta\text{-CaO}, \text{SiO}_2$ and MnO, SiO_2 . The m.p. of MnO, SiO_2 is $1205 \pm 2^\circ$. The temp. of the α - β transition of CaO, SiO_2 is raised considerably by MnO, SiO_2 . The max. temp. at which the β mixed crystals are stable is $1374 \pm 4^\circ$. Lattice dimensions as a function of composition are recorded. H. J. E.

Equilibrium diagram of the system $\text{CaO}, \text{TiO}_2, \text{SiO}_2-\text{MnO}, \text{TiO}_2$. K. IWASE and U. NISHIOKA (Sci. Rep. Tohoku, 1936, 25, 504—509).—Microscopical examination of quenched samples, combined with thermal and X-ray analysis, indicates that $\text{CaO}, \text{TiO}_2, \text{SiO}_2$ takes up MnO, TiO_2 to form a solid solution with a limit of 18 wt.-% at a eutectic point which corresponds with 1210° and 49 wt.-% of MnO, TiO_2 . J. W. S.

Phase equilibria in ternary organic mixtures. XIV. Ternary system of isomerides of acetotoluidide. K. HRYNAKOWSKI and H. STASZEWSKI (Rocz. Chem., 1936, 16, 542—550).—The composition of the ternary eutectic mixture of *o*-, *m*-, and *p*-acetotoluidide corresponds with that calc. from Kordes' formula (A., 1927, 1132). R. T.

Pictet-Trouton rule for monatomic substances. A. EUCKEN (Nachr. Ges. Wiss. Gottingen,

Math.-physik. Kl., III, 1935, [ii], 1, 127—135; Chem. Zentr., 1936, i, 2302).—Variations in the ratio L/T are explained on the classical statistical theory. An approximation formula for L/T is advanced which gives fair agreement for 23 monat. elements.

J. S. A.

Specific heat of concentrated aqueous salt solutions. J. D'ANS and H. TOLLERT (Z. Elektrochem., 1937, 43, 81—91).—The sp. heats (c_p) of aq. NaCl , KCl , Na_2SO_4 , K_2SO_4 , MgCl_2 , MgSO_4 , NaNO_3 , KNO_3 , NH_4Cl , and NH_4NO_3 have been measured for various concns. at 21° , and for nearly saturated solutions at 41° and 86° . The vals. of c_p for solid $\text{Na}_2\text{CO}_3, 10\text{H}_2\text{O}$ and $\text{Na}_2\text{SO}_4, 10\text{H}_2\text{O}$ at 3 — 19° indicate that each mol. of H_2O of crystallisation has C_p about 9.7 g.-cal. per mol., independently of the type of lattice and no. of H_2O mols. A mixture rule is developed which gives c_p for a mixed salt solution in terms of the vals. for the components, independently of double decomp. J. W. S.

Integral heat of dissolution of sodium chloride in $\text{H}_2\text{O}-\text{D}_2\text{O}$ mixtures at 25° . E. LANGE and W. MARTIN (Z. physikal. Chem., 1937, 178, 214—220).—The integral heat of dissolution for a final concn. of 0.45 mol. NaCl per 100 mols. water changes linearly with increasing D content from -1.019 for pure H_2O to -1.577 ± 0.008 kg.-cal. for pure D_2O . It is inferred that for ionic hydration in $\text{H}_2\text{O}-\text{D}_2\text{O}$ mixtures, HDO mols. are midway between D_2O and H_2O mols. in respect of energy content. R. C.

Relative partial molal heat content of zinc sulphate in aqueous solution. H. S. HARNED (J. Amer. Chem. Soc., 1937, 59, 360—361).—Calculations from published e.m.f. data (A., 1933, 466) are in agreement with those from determinations of heats of dilution (A., 1934, 149). E. S. H.

Heats of formation of silver chloride, bromide, and iodide. A. BERTRAM and W. A. ROTH (Z. physikal. Chem., 1937, 178, 227—238).—The following vals. have been obtained for 18° and const. pressure: $[\text{Ag}] + \frac{1}{2}(\text{Cl}_2) = [\text{AgCl}] + 30.13 \pm 0.05$ ($dQ/dT = -0.0024$), $[\text{Ag}] + \frac{1}{2}(\text{Br}_2) = [\text{AgBr}] + 27.56 \pm 0.05$, $[\text{Ag}] + \text{Br}_{\text{liquid}} = [\text{AgBr}] + 23.70 \pm 0.06$ ($dQ/dT = -0.0009$), $[\text{Ag}] + [\text{I}] = [\text{AgI}] + 15.34 \pm 0.03$ ($dQ/dT = -0.0003$). R. C.

Thermochemistry of boron. W. A. ROTH and E. BORGER (Ber., 1937, 70, [B], 48—54).—The heat of formation of solid, probably amorphous, B_2O_3 from B and O_2 is $+349$ kg.-cal. as determined by a new method. The heat of decomp. of B_2H_6 by H_2O to H_2 and solid B_2O_3 is about 100 kg.-cal.; the heat of formation of B_2H_6 is therefore twice that of C_2H_6 . This is due to the high lattice energy of graphite; the minimal val. is 40 kg.-cal. per g.-atom C and the true val. is probably about 100 kg.-cal. The sequence of lattice energies is C, B, Si, Be, Al. The most probable heats of formation of a series of compounds of these elements are given; many of the vals. differ considerably from those recorded previously.

H. W.

Dioximes. CXVIII. [Heats of combustion.] M. MILONE and G. VENTURELLO (Gazzetta, 1936, 66, 808—812).—The mol. heats of combustion of glyoxime,

the Me, Me₂, the α and β forms of the Ph and *p*-C₆H₄Me, and the α , β , and γ forms (I) of the Ph₂ derivatives have been determined. The mol. heat of combustion of the group C:N-OH in dioximes varies from 130.8 to 158 kg.-cal. If *a* and *b* are heats of combustion of α and β forms, $b > a$; for (I) the differences are very small.

E. W. W.

Conductivities of concentrated binary mixtures of electrolytes with a common anion and at least one ion of charge two. P. VAN RYSELBERGHE, S. W. GRINNELL, and J. M. CARLSON (J. Amer. Chem. Soc., 1937, 59, 336—339).—Sp. and equiv. conductivities of 8 groups of binary mixtures of 2:1, 2:2, and 1:1 electrolytes with a common anion at a total equiv. concn. 0.5—9*N* have been measured at 25°. A parallelism between the difference of the conductivities of the pure salts and the max. departure from the mixture rule in mixtures of the same total concn. is pointed out.

E. S. H.

Conductivities of one-molal mixtures of alkali halides and nitrates. P. VAN RYSELBERGHE and L. NUTTING (J. Amer. Chem. Soc., 1937, 59, 333—336).—Measurements of *d* and conductivity have been made for 9 pairs of alkali halides and nitrates at a total concn. of 1*M*. The mixture rule is more nearly correct when the conductivities of the component salts differ but slightly. Wide discrepancies between measured and calc. conductivities of solutions containing simultaneously Na⁺, K⁺, Cl⁻, and NO₃⁻ are reported.

E. S. H.

Electrochemical study of alkali halides in benzene and nitrobenzene solutions of aluminium bromide and chloride. V. A. PLOTNIKOV and E. J. GORENBEIN (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 471—487).—The sp. conductivity κ of solutions of AlBr₃ or AlCl₃ in C₆H₆ or PhNO₂ rises with dilution and with increasing [MX] (M = K, Rb, Li; X = Cl, Br) and falls with increasing [AlX₃]. The val. of κ in C₆H₆ is $>$ in PhNO₂. Electrolysis in PhNO₂ results in deposition of M, and in C₆H₆ of Al, at the cathode. The decomp. potentials in solutions containing both chlorides and bromides approximate to those for the bromides in both solvents.

R. T.

Electrochemical study of the systems KCl-AlBr₃, KBr-AlBr₃, and KI-AlBr₃, in benzene. V. A. KIKETZ (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 489—507).—The sp. conductivity in equiv. concns. falls in the series I $>$ Br $>$ Cl. Electrolysis of the system KI-AlBr₃-C₆H₆ results in the deposition of Al at the cathode, but KCl and AlBr₃ are also deposited in the case of the system KCl-AlBr₃-C₆H₆; Cl and Br are liberated at the anode in all cases. The cryst. products obtained by evaporation have the general composition MX₂AlBr₃ \cdot *n*C₆H₆. Cryoscopic data suggest the presence of polymerised complexes of the type (MX₂AlBr₃)_{*m*} \cdot *n*C₆H₆ in the solutions.

R. T.

Electrode potential of the iodine-iodate electrode at 25°. W. O. LUNDBERG, C. S. VESTLING, and J. E. AHLBERG (J. Amer. Chem. Soc., 1937, 59, 264—268).—The standard electrode potential $E_{298.1}^{\circ}$ = -1.195 volts. The free energy, entropy, and heat

P (A., I.)

of formation of IO₃⁻ are -32,251 g.-cal., 76.20 g.-cal. per degree, and -54,966 g.-cal., respectively.

E. S. H.

Electric potentials at crystal surfaces, and at silver halide surfaces in particular. I. M. KOLTHOFF and H. L. SANDERS (J. Amer. Chem. Soc., 1937, 59, 416—420).—The e.m.f. of cells involving Ag halide membranes of the type Ag|AgX(*s*), X⁻(*a*₁)|AgX|X⁻(*a*₂)|KNO₃(sat.)|KCl(sat.)|Hg₂Cl₂|Hg is given by $E = E_0 + (RT/F) \log_e a_2$. Experimental results with fused Ag halide membranes are in agreement with theory.

E. S. H.

Potential of copper in solutions of copper benzenesulphonate. (MLLE.) M. QUINTIN (Compt. rend., 1937, 204, 422—424).—E.m.f. measurements for the cell Cu amalgam|(PhSO₃)₂Cu(*c*)|KCl sat.|KCl 0.1*N*, Hg₂Cl₂, Hg are recorded. For aq. solutions, the variation of *E* with *c* follows the limiting law of Debye and Hückel. $E_0 = -0.3454$ volt.

A. J. E. W.

Determination of the individual potentials of metals dissolved in aluminium bromide. J. K. DELIMARSKI and V. A. ISBEKOV (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 541—561).—The potentials of the electrodes M|0.1*N*-MBr in AlBr₃-KBr, measured against a Hg₂Cl₂ electrode, rise in the series Tl $<$ Al $<$ Zn $<$ Pb $<$ Cd $<$ Sn $<$ Ag $<$ Cu $<$ Fe $<$ Hg $<$ Co $<$ Ni $<$ Sb $<$ Bi, whilst the decomp. potentials vary in the inverse order.

R. T.

Potentials at the interface of two liquid phases. V. K. KARCEWSKI (Rocz. Chem., 1936, 16, 560—565).—The potential effects at the H₂O-*iso*-C₅H₁₁OH interface due to Na or K salts (MCNS, MI, MBr, and MCl) follow the addition rule when mixtures of salts are added.

R. T.

Kelvin single potential differences. W. D. BANCROFT and J. D. PORTER (J. Physical Chem., 1936, 40, 1201—1216).—The single p.d. at the various junctions in a voltaic cell have been determined within 0.1 volt by inserting an ionised air gap at each junction successively. The examination in this manner of a AgCl concn. cell, Daniell cell, Pb storage battery, and Pt-H₂ electrode is described in detail. It is found, e.g., that in a Daniell cell the single p.d. at the metal-electrolyte and liquid-liquid junction is approx. zero, and that nearly the whole of the observed p.d. is due to the Zn-Cu junction.

F. L. U.

Adsorption condenser and electromotive force. J. F. CHITTUM and H. HUNT (J. Physical Chem., 1936, 40, 1083—1093).—Theoretical. Single electrode potentials are supposed to involve a metal-surface work function and a colloidal absorption condenser. The theory advanced permits an explanation of overvoltage, electrokinetic potential, e.m.f., and the mechanism of conduction at a metal-solution interface.

F. L. U.

Electrolytic reduction potential of pyrrole aldehydes. II. G. B. BONINO and G. SCARABELLI (Ric. sci. Prog. tecn. Econ. naz., 1935, 6, II, 180—181; Chem. Zentr., 1936, i, 2324—2325).—The reduction potentials of 2:4-dimethyl-3-ethyl- (1.342 volt), 2-methyl-3:4-diethyl- (1.340 volt), and 2:3:4-tri-

methyl- (1.338 volt) -pyrrole-5-aldehyde have been measured. The results suggest that C-alkylation causes enhanced distortion of the $\cdot\text{CHO}$ group.

H. N. R.

Polarographic studies with the dropping mercury cathode. LXIII. Verification of the equation of the polarographic wave in the reversible electro-deposition of free cations. J. TOMES (Coll. Czech. Chem. Comm., 1937, 9, 12—21; cf. A., 1935, 305).—The potential at which the current reaches $1/p$ of the val. of the limiting ("diffusion") current is independent of the concn. of the ion, the rate of dropping of the Hg or the scale of co-ordinates (cf. *ibid.*, 936), and by choosing suitable vals. of p , the valency of the ion can be deduced from the polarographic wave. The general equation has been verified for the deposition of Ti^+ , Pb^{++} , Cd^{++} , and In^{++} , and the "half-wave" ($p=2$) potentials are -0.521 , -0.473 , -0.684 , and -0.636 volt, respectively, in relation to the normal Hg_2Cl_2 electrode.

J. G. A. G.

Polarisation capacity and electrode condition. I. WOLFF (Physics, 1936, 7, 203—210).—The polarisation capacity, C , of a single cell with Pt electrodes has been measured at intervals during 6 months with frequencies of 200—200,000 cycles. The relation between C and frequency is controlled mainly by the concn. of the electrolyte (H_2SO_4 or HCl). In general, C rises as $[\text{H}_2\text{SO}_4]$ and temp. are increased. C may be greatly diminished by treating the electrodes with H_2S or CO and subsequently restored to approx. the initial val. by the action of electrolytic H or O .

J. G. A. G.

Polarographic studies. IV. Exaltation of limiting currents. Influence of oxygen on the limiting currents for different cations. W. KEMULA and M. MICHALSKI (Rocz. Chem., 1936, 16, 535—541).—Exaltation of the limiting current is observed in the electrolysis of 0.001*N*-KCl saturated with O_2 , as compared with solutions saturated with H_2 . The reverse effect is obtained with 0.001*N*-HCl; this is ascribed to the reactions $\text{O}_2 + 2\text{H}_2\text{O} \rightarrow \text{H}_2\text{O}_2 + 2\text{OH}^-$; $\text{H}_2\text{O}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{H}_2\text{O} + 2\text{OH}^-$; $\text{OH}^- + \text{H}^+ \rightarrow \text{H}_2\text{O}$.

R. T.

Azide potential. P. C. BLOKKER (Rec. trav. chim., 1937, 56, 52—58).—The potential at platinised and bright Pt anodes during the electrolysis of *N*- NaN_3 solution, with and without added KCNS, has been determined. KCNS lowers the positive potential, the oxidation of NaN_3 by I in presence of KCNS thus being explained. A carbylamine is detectable when electrolysis takes place in presence of PhOH .

A. J. E. W.

Anode potential of chromium during alternating current electrolysis. II. Interpretation of the results and supplementary experiments. A. GELDBACH and M. SCHLOTTER (Z. Elektrochem., 1937, 43, 91—103; cf. this vol., 84).—The anode potential v of Cr has been measured with superimposed a.c. and d.c. for varying vals. of a.c.d. (i_a) and d.c.d. (i_d) at frequencies (n) of 15—5000 cycles in *N*- H_2SO_4 and *N*- HCl solutions. At const. i_d the val. of i_a required for activation increases with increasing n . Curves which connect the mean v with

i_a at const. i_d and n can be divided into three groups, according to the crit. c.d. determined by the anodic d.c. polarisation. The interpretation of the results is discussed.

J. W. S.

Electromotive force of cells with non-aqueous solvents. II. Lithium amalgam electrodes in non-aqueous solvents. G. SPIEGEL and H. ULJOH (Z. physikal. Chem., 1937, 178, 187—192; cf. A., 1936, 1206).—By means of the cells Li amalgam dropping electrode (x_1) | LiCl solution in MeOH, MeCN, or COMe_2 | Li amalgam dropping electrode (x_2), the activity coeffs. of the Li in the amalgams have been determined. The coeffs. for LiCl in MeCN, derived from measurements with concn. cells without transport, agree with the Debye-Hückel-Bjerrum formulae. LiCl seems to be almost completely ionised in MeCN.

R. C.

Poisoning of hydrogen electrodes by hydrogen sulphide. H. JABŁCZYŃSKA-JĘDRZEJEWSKA and J. DOMAŃSKI (Rocz. Chem., 1936, 16, 574—581).—The potential of a H_2 electrode rises immediately after addition of aq. H_2S , owing to adsorption of H_2S , followed by ionisation, the S anions remaining on the electrode. This effect is followed by inactivation of the electrode at a rate $\propto [\text{H}_2\text{S}]$, and inversely \propto thickness of the layer of Pt-black. The effect in equiv. concns. of different acids varies in the order $\text{HCl} = \text{HBr} = \text{H}_2\text{SO}_4 > \text{H}_3\text{PO}_4$. The phenomena are unaffected by illumination of the electrode.

R. T.

Influence of colloids on cathodic polarisation. Electrodeposition of nickel in presence of Paal's mixture. G. S. VODVISHENSKI and F. F. FAJSULIN (J. Phys. Chem. Russ., 1936, 8, 472—476).—Cathodic polarisation of a Ni electrode in presence of Paal's mixture (product of alkaline hydrolysis of albumin) has been measured by a method in which the equilibrium potential is determined immediately after each measurement at a given c.d.

E. R.

Passivity of iron and steel in nitric acid solution. XIV. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 59—90; cf. this vol., 141).—The dissolution of Fe in HNO_3 of concn. $>40\%$ is accelerated by the addition of $\text{CO}(\text{NH}_2)_2$ (I) owing to increase in the degree of ionisation, but the dissolution of Cu in HNO_3 of concn. $<50\%$ is suppressed by (I) owing to removal of HNO_2 . With $\text{HNO}_3 >50\%$ the dissolution of Cu is accelerated by (I) probably owing to the formation of a Cu-NH_3 complex from NH_3 formed during the reaction. AgNO_3 increases the dissolution of Fe in the active state as well as the ability to render Fe passive. Cu can act as an O electrode in a cell containing 21—30% HNO_3 and AgNO_3 owing to the reaction $2\text{AgNO}_3 + 4\text{HNO}_3 = 2\text{Ag}(\text{NO}_3)_2 + 2\text{HNO}_2 + \text{H}_2\text{O} + \text{O}$.

R. S. B.

Platinum-nickel system in electrometry. IV. Reactions in acid titrations. I. A. ATANASIU and A. I. VELCULESCU (Bul. Soc. Chim. Romania, 1936, 18, 53—58; cf. A., 1935, 952).—Vals. for the potential of the system Pt-Ni in aq. NaOH and aq. HCl are recorded. This electrode may be used in titrating strong acids with strong or weak bases, and weak

bases with weak acids. Examples are given. It resembles the Pt-W system. H. J. E.

Electrical conductivity of solutions containing sodium hydroxide and phosphoric acid. S. M. MEHTA and S. M. SHETH (J. Univ. Bombay, 1936, 5, Part II, 83—90).—Titration curves at 30° show breaks corresponding with NaH_2PO_4 and Na_2HPO_4 . Na_3PO_4 is almost completely dissociated in dil. solutions. E. S. H.

Hydrogen-ion concentration of solutions containing sodium hydroxide and phosphoric acid. S. M. MEHTA and S. M. SHETH (J. Univ. Bombay, 1936, 5, Part II, 91—100).—The p_H -composition curve, determined by the glass electrode, shows breaks at NaH_2PO_4 , $2\text{NaH}_2\text{PO}_4 \cdot 3\text{H}_3\text{PO}_4$, and, in conc. solutions, at $2\text{NaH}_2\text{PO}_4 \cdot \text{H}_3\text{PO}_4$ and $\text{NaH}_2\text{PO}_4 \cdot \text{H}_3\text{PO}_4$. E. S. H.

Effect of temperature on solutions of sodium phosphate in presence of organic acids. A. N. MELDRUM and N. M. SHAH (J. Univ. Bombay, 1936, 5, Part II, 102—104).—With rise of temp. between 25° and 60°, the amount of Na_2HPO_4 required to give a standard tint to phenolphthalein in presence of a const. amount of org. acid decreases linearly. E. S. H.

Streamline scattering in electrolytes. W. KANGRO and K. M. WAGNER (Z. Elektrochem., 1937, 43, 119—127; cf. A., 1936, 1341).—The fall in c.d. outside the electrode zone has been measured and a scattering const. calc. For aq. CuSO_4 , ZnSO_4 , and ZnCl_2 this has the val. 0.2—0.5 cm^{-1} at room temp. Its dependence on total c.d., conductivity, ionic strength, concn., and the chemical nature of the ions is discussed. For the electrode zone, the deviation of the current distribution curve from the "ideal" curve is logarithmic, the const. being dependent on the angle of the cathode. Measurements made with 30° and 60° conical cathodes indicate max. of c.d. at the apex and around the base of the cone. J. W. S.

Formation of aluminium-copper and zinc-iron alloys in galvanic elements. V. A. PLOTNIKOV and D. P. ZOSIMOVITSCH (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 509—519).—The e.m.f. of the cell $\text{Al}|\text{AlCl}_3\text{—NaCl}|\text{Cu}$, at 200—500°, falls with time, as a result of formation of a layer of Al-Cu alloy at the cathode. Substitution of a Pb or Cd for the Cu electrode results in a similar fall in e.m.f., but the initial val. is almost immediately established on breaking the circuit; this points to the formation of unstable Al-Pb or -Cd alloys. Very little diminution in e.m.f. is shown by the cell $\text{Zn}|N\text{—ZnSO}_4|\text{Fe}$ (11—90°), but Fe electrodes thus treated exhibit augmented resistance to corrosion. The layer of brass formed in the cell $\text{Cu}|\text{ZnCl}_2|\text{Zn}$ is more resistant to corrosion than the original Cu surface. R. T.

Structure of metal ketyls. V. Conductance function. C. B. WOOSTER (J. Amer. Chem. Soc., 1937, 59, 377—383; cf. A., 1935, 345).—The conductance of the Na derivative of CPh, in liquid NH_3 can be interpreted quantitatively by assuming certain equilibria. The structure of the ion pair is discussed. E. S. H.

P^* (A., I.)

Electrochemical studies of humate formation. I. A. CHAINSKI (Kolloid. Shurn., 1936, 2, 61—83).—Ionic exchange between humic acid sols and alkali or alkaline-earth hydroxides takes place during 9—10 days after mixing. The potentiometric titration curves of humic acid exhibit only one break, corresponding with simultaneous neutralisation of all four available CO_2H groups. Alkaline-earth humates are not appreciably hydrolysed at $p_H < 7$, in contrast to alkali-metal humates. Peptisation of the sols by alkali hydroxides or coagulation by alkaline-earth hydroxides is complete at $p_H 7$. R. T.

Simpler aspects of electrochemistry. C. W. BENNETT (J. Chem. Educ., 1936, 13, 516—520).

L. S. T.

Bimolecular reactions. Calculation of the duration of chemical reactions. II. H. SCHWERDT-FEGER (Österr. Chem.-Ztg., 1937, 40, 106—109).—A mathematical treatment based on the law of mass action. C. R. H.

Theory of thermal explosions. I. Thermal explosion for reactions of "zero" order. O. M. TODES (Acta Physicochim. U.R.S.S., 1936, 5, 785—806).—The induction period, the ignition of adiabatic and partly adiabatic explosions, and ignition by means of adiabatic compression are considered mathematically. C. R. H.

Variation of velocity of detonation waves with temperature and water content of explosive mixtures. S. GRIBKOVA (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 734—743).—Induction periods and initial propagation velocities of $\text{H}_2\text{—O}_2$ mixtures are determined under varying conditions.

CH. ABS. (p)

Frequency of detonation spin. K. SCHTSCHELKIN (J. Exp. Theor. Phys. U.S.S.R., 1934, 4, 729—733).—Mathematical. CH. ABS. (p)

Ignition of a methane-air mixture by electric sparks of direct and alternating currents. N. I. BRASCHNIK, A. E. MALINOVSKI, and K. A. SKRUPNIKOV (J. Tech. Phys. Russ., 1934, 4, 1485—1492).—With similar p.d. and current strength the effects of a.c. and d.c. are the same in principle; safety requirements are the same. CH. ABS. (p)

Kinetics of the combustion of methane. R. G. W. NORRISH and S. G. FOORD (Proc. Roy. Soc., 1936, A, 157, 503—525).—The reaction between CH_4 and O_2 exhibits a marked induction period, during which no appreciable change of pressure occurs, at about 480°. This is followed by a pressure increase in the system which reaches a steady max. rate given by $k[\text{CH}_4]^2[\text{O}_2]P$, where P = total pressure. The magnitude of k is strongly dependent on the catalytic activity of the surface of the vessel; the reaction is almost completely inhibited by packing the vessel with small-diameter quartz tubing. Ignition occurs by a thermal process when the velocity of the slow reaction reaches a val. high enough for the system to become adiabatic. The inhibiting and catalytic properties of various added substances have been determined by their effect on both the slow reaction and the ignition temp. A combination of the atom chain hypothesis and the theory of

degenerate branching gives a complete interpretation of the kinetic relationships. L. L. B.

Mechanism of the decomposition of ethane. A. V. FROST (J. Phys. Chem. Russ., 1936, 8, 290—294).—The scheme proposed by Rice and Herzfeld (A., 1934, 369) is completed by considering reactions of the type $H + C_2H_4 \rightarrow C_2H_5$. J. J. B.

Change of temperature of spontaneous inflammability of hydrocarbon-air mixtures with experimental conditions. M. PRETTE (XIV Congr. Chim. ind. Paris, 1934, Comm. 2, 6 pp.; Chem. Zentr., 1936, i, 2482).—Increased pressure lowers the temp.; it is suggested that the reaction chains might be broken by alkali or alkaline-earth salts. H. N. R.

Explosion of hydrocarbon mixtures.—See B., 1937, 206.

Burning of gases. V. F. KORITOV (Acta Physicochim. U.R.S.S., 1936, 5, 813—818).—Data for the distribution of temp. in flames of burning air-coal gas mixtures have been successfully applied to the verification of the law of Mallard and Le Chatelier. C. R. H.

Temperature of open flames. W. T. DAVID (Phil. Mag., 1937, [vii], 23, 251—256).—The temp. reached in the combustion of $CO-O_2$ mixtures in closed vessel explosions was determined during the "pre-pressure" interval by a Pt resistance method. The results are compared with those obtained by the Na method (A., 1929, 534) in the region of the open flame where the temp. is uniform. Allowing for the fact that in the Na method damp gases were employed, the results of the two methods correspond closely in the neighbourhood of the "correct" mixture, but as the mixtures become richer in CO there is a considerable difference between them. It is concluded that the Na method does not provide a means of obtaining true temp. The accuracy of the val. obtained by the Pt resistance method is discussed. A. J. M.

Explosion limits of hydrogen and chlorine with oxygen, carbon monoxide, and nitrous oxide, and of carbon monoxide and oxygen with chlorine and nitrogen, also of carbon monoxide with nitrous oxide. E. W. LINDEJER (Rec. trav. chim., 1937, 56, 105—118).—The apparatus and technique are described, and ternary diagrams for the above systems given. A. J. E. W.

Determination of explosion limits. E. W. LINDEJER (Rec. trav. chim., 1937, 56, 97—104).—The influence of the ignition intensity on the apparent explosivity of gas mixtures is discussed. If the ignition intensity is too low, the experimentally determined explosion limit may be an "ignition limit," distinct from the true explosion limit, which is an inherent property of the mixture. A. J. E. W.

Explosion regions at reduced pressure. II. Influence of pressure on the explosion limits of binary and ternary systems containing CH_4 , $MeCl$, O_2 , and N_2O ; quenching action of CO_2 and SO_2 . III. Applicability of simple formulæ to experimental data in binary and ternary systems. J. DROP (Rec. trav. chim., 1937, 56, 71—85, 86—96; cf. A., 1935, 1080).—II. Data for

the following systems, at pressures >60 cm., are given: $CH_4-O_2-CO_2$, $CH_4-O_2-SO_2$, $CH_4-N_2O-CO_2$, $CH_4-N_2O-SO_2$, $CH_4-MeCl-O_2$, $CH_4-O_2-N_2O$, and $MeCl-N_2O$. Repeated explosions at low pressure caused the reaction vessel walls to become catalytically active.

III. A discussion and mathematical analysis of previous results. The explosion regions of ternary systems containing an inhibitor possess rectilinear diameters, the explosion limits lying on hyperbolæ. The effect of inhibitors is discussed. A. J. E. W.

Thermal decomposition of gaseous hydrogen peroxide. G. B. KISTAKOWSKY and S. L. ROSENBERG (J. Amer. Chem. Soc., 1937, 59, 422).—Decomp. of 70% H_2O_2 in a quartz flask at 85° and 98° is heterogeneous, with an almost negligible temp. coeff. E. S. H.

Inhibitory effect of packing on the methyl ether decomposition. R. N. PEASE (J. Amer. Chem. Soc., 1937, 59, 425).—The rate of decomp. of Me_2O at 481° is decreased when the reaction tube is packed with Pyrex chips (cf. A., 1927, 630). E. S. H.

Mechanism of vinyl polymerisations. P. J. FLORY (J. Amer. Chem. Soc., 1937, 59, 241—253).—The polymerisation is explained by a mechanism consisting in (1) chain initiation, (2) chain propagation, (3) chain transfer, and (4) destruction of active centres. On this basis the kinetics of polymerisation have been analysed. Equations representing the course of the conversion have been deduced; they agree with available experimental data. The variation of mol. wt. with temp. agrees with the proposed mechanism. Activation energies of the individual processes have been evaluated and heats of polymerisation calc. E. S. H.

Thermal decomposition and explosion of methyl nitrate vapour. A. APPIN, J. CHARITON, and O. TODES (Acta Physicochim. U.R.S.S., 1936, 5, 655—678).—The decomp. of $MeO-NO_2$ vapour between 210° and 240° and at 5—15 mm., as deduced from pressure measurements, is unimol., with $K = 2.5 \times 10^{14} e^{-39500/RT}$. The pressure limit of explosion rises from 4.2 mm. at 324° to 163 mm. at 246°, and is greatly increased by increase in the ratio surface/vol. of the containing vessel. The relationships deduced by integrating the equation of thermal explosion agree with those observed. F. L. U.

Effect of nitrogen peroxide and methyl nitrite on the spontaneous inflammation of ethane and oxygen. G. GIMMELMAN, M. NEUMANN, and P. SOKOV (Acta Physicochim. U.R.S.S., 1936, 5, 903—917, and J. Phys. Chem. Russ., 1936, 8, 458—467).— NO_2 and $MeO-NO$ reduce the temp. at which $C_2H_6-O_2$ mixtures spontaneously ignite, the effect of $MeO-NO$ being approx. twice that of NO_2 , due partly to formation of NO_2 on decomp. of $MeO-NO$. An optimum concn. of 1.5% NO_2 or $MeO-NO$ was observed at low pressures. The velocity of C_2H_6 oxidation increases with increase of pressure. The kinetics of the reactions are discussed. C. R. H.

Rate of dehydration of ethyl alcohol using metallic calcium. G. F. SMITH and C. A. GETZ

(Ind. Eng. Chem. [Anal.], 1937, 9, 100—102).—With <0.5% of H_2O the products are $\text{Ca}(\text{OH})_2$ and H_2 ; with <0.2% of H_2O they are $\text{Ca}(\text{OEt})_2$ and H_2 . The reaction $\text{Ca}(\text{OEt})_2 + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + 2\text{EtOH}$ is more rapid than the preceding reactions. The crit. solution temp. of the system kerosene-EtOH has been used to determine the H_2O content of EtOH.

E. S. H.

Homogeneous reactions with an undulating velocity curve. E. H. RIESENFELD and T. L. CHANG (Z. anorg. Chem., 1937, 230, 239—252; cf. A., 1934, 848).—When KMnO_4 is reduced by H_2O_2 , $\text{H}_2\text{C}_2\text{O}_4$, NH_2OH , N_2H_4 , or H_3PO_2 , the reaction-velocity curve has a wave form. A detailed study of these reactions shows that they can proceed either normally or autocatalytically, and then in a certain concn. range the velocity is reduced owing to removal of the catalyst in a side reaction. The usual assumption that Mn^{++} ions act as a direct catalyst in the reduction of KMnO_4 is incorrect. The catalyst is actually a product formed by interaction of Mn^{++} and MnO_4^- in which the Mn has a valency of 3, 4, or 5.

F. L. U.

Transmission of a detonation between initiating explosive substances. I. General aspect of the phenomenon. A. F. BELAEV and J. B. CHARITON. II. Influence of the distance between the charges and the effect of the surface area of the passive charge on the probability of transmission of a detonation. A. F. BELAEV, J. B. CHARITON, and E. RDULTOVSKAJA. III. Size of the particles transmitting the detonation. A. F. BELAEV and J. B. CHARITON (Acta Physicochim. U.R.S.S., 1936, 5, 757—766, 767—776, 777—784).—I. The detonation of a 0.002-g. crystal of PbN_6 (active charge) is transmitted in vac. through distances of the order of 40 cm. to another crystal of PbN_6 (passive charge). The detonation of the passive charge can be prevented by a screen placed between the two charges, whilst the detonation can be transmitted through apertures in the screen. The sensitivity of PbN_6 is affected by exposure to air. The probability of transmission over a given distance depends on the method of preparing the passive charge and on its surface area. Detonation appears to be transmitted by microscopic particles scattered at a velocity of the order of 3 km. per sec. in vac., and at approx. half this velocity in air at a pressure of 12 mm. of Hg.

II. On the assumption that a single microscopic particle is sufficient to detonate the passive charge, the probability of detonation by transmission has been calc. for various distances between the charges, and for various surface areas of the passive charge. The data suggest that the transmission of particles is non-uniform, and is less uniform than that of a random distribution.

III. Calculation gives the no., linear dimensions, and mass of particles ejected from 0.0017 g. active charge as being of the order of 4×10^5 , 10^{-4} cm., and 10^{-11} g., respectively. The law of retardation of a high-speed microscopic particle in air has been deduced. The mechanical action of the particles when they strike a glass surface is described.

C. R. H.

Temperature coefficient of thermal decomposition of silver oxalate. J. Y. MACDONALD (J.C.S., 1937, 273—274; cf. A., 1936, 940).—Contrary to the statement of Benton and Cunningham (*ibid.*, 37), the rate of decomp. of $\text{Ag}_2\text{C}_2\text{O}_4$ at 80° shows no abnormality, and the temp. coeff. for 80 — 110° (2.77) agrees with that previously found.

F. L. U.

Application of the thermochemical method to the study of the corrosion of metals. (MLLES.) A. DORABIALSKA and E. TURSKA (J. Chim. phys., 1937, 34, 28—36).—Microcalorimetric experiments show that when Fe is placed in 2.5 or 5% H_2SO_4 , the rate of evolution of heat, δ , falls rapidly to a val. which then gradually decreases to zero. $\text{C}_5\text{H}_5\text{N}$ eliminates the high initial val. of δ , but heat is evolved during a long period. δ increases with temp. and $[\text{H}_2\text{SO}_4]$.

J. G. A. G.

Influence of the velocity of detonation of an explosive on the velocity of the explosion wave. P. LAFFITTE and A. PARISOT (Compt. rend., 1937, 204, 179—181; cf. A., 1924, ii, 399).—Relationships between the velocity of detonation and the initial velocity of the explosion wave were examined for four explosives.

A. J. E. W.

Rates of dissolution of gold and silver in cyanide solutions.—See B., 1937, 246.

Decomposition of solutions of sodium sulphide. G. BULFER, A. J. BOYLE, and L. H. BALDINGER (J. Amer. Pharm. Assoc., 1936, 25, 1104—1106).—The decomp. of Na_2S is partly inhibited by the presence of 15—30% of glycerol or $(\text{CH}_3)_2\text{OEt}$.

F. O. H.

Acid catalysis in liquid ammonia. II. Kinetics of ammonolysis of desmotroposantonin and diethyl tartrate in liquid ammonia in presence of ammonium salts. A. I. SCHATTENSTEIN (Acta Physicochim. U.R.S.S., 1936, 5, 841—852).—Data were obtained at 20° in presence of NH_4Cl , NH_4Br , and NH_4I , and, in the case of Et₂ tartrate, in presence of NH_4NO_3 and NH_4ClO_4 . The salt effect increases in the same order as was observed in the ammonolysis of santonin (cf. A., 1936, 1075), *i.e.*, in the reverse order of increase of activity, conductivity, and osmotic coeffs.

C. R. H.

Influence of high concentrations of sulphuric acid on the velocity of oxidation of sulphur dioxide by oxygen in presence of bivalent manganese ions.—See B., 1937, 236.

Reactions catalysed by aluminium chloride. XVI.—See A., II, 152.

Catalytic dehydrogenation of dihydrocoumarins.—See A., II, 163.

Catalytic polymerisation of ethylenic derivatives.—See A., II, 141.

Kinetics of the ammonia synthesis on technical iron catalyst. V. FINKELSTEIN and M. RUBANIK (Acta Physicochim. U.R.S.S., 1936, 5, 921—923).—A theoretical error previously made (cf. B., 1935, 801; 1936, 985) is corr. without necessitating any change in the vals. of the apparent activation

energy. The foundation on which a mechanism for the synthesis of NH_3 was based is considered invalid.

C. R. H.

Catalytic action of metallic rhenium on ammonia synthesis. C. ZENGHELS and E. STATHIS (Österr. Chem.-Ztg., 1937, 40, 80—81).—The catalytic action of Re on a $\text{N}_2 + 3\text{H}_2$ mixture at 85° and 1 atm. is small. Using nascent N from $\text{NH}_4\text{Cl} + \text{NaNO}_2$, a considerable catalytic activity which is promoted by the addition of Fe is displayed.

J. S. A.

Variation of catalytic power of ferromagnetic substances at the Curie point. H. FORESTIER and R. LILLE (Compt. rend., 1937, 204, 265—267).—The effectiveness of Fe_3O_4 , Fe_2O_3 , SrO , and Fe_2O_3 , NiO in catalysing the reaction $\text{CO}_2 + \text{H}_2 \rightarrow \text{CO} + \text{H}_2\text{O}$ showed an abrupt increase in the neighbourhood of the Curie point.

A. J. E. W.

Rare earths as catalysts. B. S. HOPKINS and W. A. TAEDEL (Trans. Electrochem. Soc., 1937, 71, Preprint 6, 45—51).—A summary of the uses of Ce and other rare earths as catalysts.

J. W. C.

Cobalt as a catalyst. C. G. FINK (Trans. Electrochem. Soc., 1937, 71, Preprint 5, 39—44).—An explanation of the catalytic properties of Co_2O_3 and other Co compounds, and of the behaviour of insol. Co-Si anodes, is advanced. Applications are discussed.

J. W. C.

Rate of reaction in the vanadium contact sulphuric acid process.—See B., 1937, 234.

Catalytic decomposition of hydrogen peroxide by aluminium oxyhydride hydrosols. A. W. THOMAS and B. COHEN (J. Amer. Chem. Soc., 1937, 59, 268—272).—The catalytic activity of Al oxyhydride sols is much $>$ that of I' solutions of equiv. concn., and is lowered by adding certain K salts, the order of effectiveness being $\text{tartrate} > \text{SO}_4^{2-} > \text{OAc}^- > \text{NO}_3^-$. This is also the order of effectiveness in increasing the I' activity of the sols. The added anions probably displace I from the micelle, converting it into I'.

E. S. H.

Preparation of metal catalysts. I. Active copper and its hydrogenating and dehydrogenating reactions. II. Active cobalt and its hydrogenating and dehydrogenating reactions. L. FAUCONNAU (Bull. Soc. chim., 1937, [v], 4, 58—63, 63—67).—I. Active Cu, prepared from Al-Cu-Zn alloy and NaOH (A., 1936, 1212), behaves like reduced Cu as a catalyst for the hydrogenation of double linkings at the end of a chain. It does not assist the hydrogenation of the C_6H_6 nucleus.

II. Active Co, prepared as formerly described (*loc. cit.*), is a slightly more efficient catalyst than Cu for dehydrogenation reactions; for hydrogenation its activity is at least equal to that of reduced Co. At 100°C C:C or C:C linkings can be saturated and aldehydes or ketones reduced to alcohols. With C_6H_6 derivatives the chains are hydrogenated at 100° , but at 200° the ring is also hydrogenated.

E. S. H.

Kinetics of the oxidation of nitrogen oxide in presence of activated charcoal. G. K. BORESKOV and S. M. SCHOGAM (J. Phys. Chem. Russ., 1936, 8, 306—325).—Mixtures of NO, O_2 , and NO_2 were passed

through charcoal. The approx. equation $K = [\text{NO}]^{1.5}[\text{O}_2]/[\text{NO}_2]^{0.5}$ holds in the presence or absence of CO_2 or N_2 . H_2O vapour strongly diminishes K. From 8° to 70° K rises, and from 70° to 120° decreases, with activation energy 3400 g.-cal.

J. J. B.

Relationship between spatial structure and biocatalytic properties of allotropic iron oxides. O. BAUDISCH (Ber., 1937, 70, [B], 218—223).—Molten carbonyl Fe is freed from traces of C by prolonged ignition in H_2 and the spectroscopically pure Fe thus obtained is dissolved in HCl and transformed into $\gamma\text{-Fe}_3\text{O}_4 \cdot \text{H}_2\text{O}$ (I): $\text{Fe} + \text{HCl} \rightarrow \text{FeCl}_2$; $\text{FeCl}_2 + \text{C}_5\text{H}_5\text{N} \rightarrow \text{FeCl}_2(\text{C}_5\text{H}_5\text{N})_4$ which on autoxidation gives (I). When heated in an open Pyrex tube at 240° (I) passes into $\gamma\text{-Fe}_2\text{O}_3$ (II) whereas in a sealed tube it affords $\alpha\text{-Fe}_2\text{O}_3$ (III). (II) is brown, cubic, and ferromagnetic, free from FeO and foreign electrolytes. It strongly accelerates the decomp. of H_2O_2 and becomes blue by autoxidation in presence of 2:7-diaminofluorene hydrochloride (IV). It yields black magnetite in presence of $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$. It strongly promotes the growth of *B. leprosepticum* in presence of α -factor and greatly prolongs the life of the pneumonia bacillus. (III) is tile-red, rhombohedral and paramagnetic, free from FeO and foreign electrolytes. It very slightly accelerates the decomp. of H_2O_2 and remains unchanged in the presence of (IV). It retains its colour in contact with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ and is without influence on the growth of *B. leprosepticum* or the life period of the pneumonia bacillus.

H. W.

Relationship between spatial structure and biological action of allotropic iron oxides. V. Action of hydrazine hydrate on spectroscopically pure, magnetic iron oxides prepared by different methods. O. BAUDISCH and S. HOLMES (Ber., 1937, 70, [B], 223—227).—Magnetically soft $\gamma\text{-Fe}_2\text{O}_3$ (I) and $\alpha\text{-Fe}_2\text{O}_3$ (II) are obtained by heating spectroscopically pure $\gamma\text{-Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ at 240° in an open or closed vessel, respectively. Magnetically hard $\gamma\text{-Fe}_2\text{O}_3$ (III) is obtained by reducing hæmatite in molten NaOAc at 460° to black magnetite, which is oxidised by molten KNO_3 at 360° , whereby minimal amounts of Fe^{2+} usually remain. Under identical conditions (I), (III), and (II) are reduced by aq. N_2H_4 to the extent of 7.31%, 3.66%, and 1.26%, respectively. $\gamma\text{-Fe}_2\text{O}_3$ is immediately reduced by aq. ascorbic acid, whereby Fe^{2+} passes into solution.

H. W.

Electrolysis of aqueous solutions of ammonium bromide. F. JIRSA (Z. Elektrochem., 1937, 43, 77—81).—The initial products of the electrolysis of aq. NH_4Br are H_2 and Br_2 , but the latter reacts with NH_4Br , thus: $\text{NH}_4\text{Br} + \text{Br}_2 \rightarrow \text{NH}_2\text{Br} + 2\text{HBr}$, the NH_2Br decomposing catalytically, $4\text{NH}_2\text{Br} \rightarrow 2\text{NH}_4\text{Br} + \text{N}_2 + \text{Br}_2$, or at higher temp. reacting with H_2O to yield NH_4OBr , which further reacts with HBr, with liberation of Br_2 . The current yields of Br_2 , HBr, N_2 , and O_2 have been measured at various concns., c.d., and temp.

J. W. S.

Electrolytic oxidation. IX. Anodic oxidation of chromic salts to chromates. R. F. J. GROSS and A. HICKLING (J.C.S., 1937, 325—330; cf. A., 1936, 1472).—Using a smooth Pt anode in 0.1M- $\text{KCr}(\text{SO}_4)_2$ and 0.5N- H_2SO_4 , and c.d. 0.01 amp. per

sq. cm., the current efficiency (E) in the reaction $\text{Cr} \rightarrow \text{CrO}_4^{2-}$ rises from 1% at 20° to 77% at 69°, above which no further increase occurs. E at room temp. for different anode materials was: smooth Pt 1%, PbO_2 100%, gas C 1%, platinised Pt (cathodically polarised) 97%, anodically polarised 43%. E increases with increasing $[\text{Cr}^{+++}]$. Oxidation with a Pt anode is greatly favoured by working in neutral and alkaline solution. Catalysts for H_2O_2 decomp. increase E in acid and diminish it (except Pb and Ag salts) in neutral solution. No definite oxidation-reduction potential appears to be associated with the reaction. The results can be satisfactorily explained by assuming that oxidation is due in part to O, through the intermediate formation of a metal peroxide, in both acid and alkaline solutions. In neutral or alkaline solution it is also partly due to the formation of H_2O_2 , which is shown to oxidise Cr^{+++} to CrO_4^{2-} under these conditions. F. L. U.

Electrolysis of germanochloroform or hydrochlorogermanic acid. A. TCHAKIRIAN (Compt. rend., 1937, 204, 117—118).—Electrolysis of a solution of GeHCl_3 in 7*N*-aq. HCl gives $\text{Ge}(\text{OH})_2$ or a solution containing bivalent Ge at the anode, according to the $[\text{HCl}]$ at the electrode. The existence of $[\text{Ge}^{++}\text{Cl}_2]^-$ is deduced. A. J. E. W.

Anode reactions. W. D. BANCROFT (Trans. Electrochem. Soc., 1937, 71, Preprint 7, 53—63).—The theory of the electrolytic production of $\text{H}_2\text{S}_2\text{O}_8$ and its compounds is discussed and the anodic reactions involved in the electrolysis of Na_2SO_4 , Na_2SO_3 , and $\text{Na}_2\text{S}_2\text{O}_3$ are considered in detail. There is no evidence to suggest that H_2O_2 is an intermediate product in the formation of $\text{H}_2\text{S}_2\text{O}_8$. J. W. C.

Application of electrolytic polishing to the study of metallic deposits. P. JACQUET (Compt. rend., 1937, 204, 172—174).—Electrolytic deposition of Cu on electrolytically polished Cu surfaces (A., 1936, 571) occurs initially on surface irregularities or on grains of certain orientations. The deposit has cryst. structure. A. J. E. W.

Quantum yield of the photosensitised decomposition of water and of ammonia. H. W. MELVILLE (Proc. Roy. Soc., 1936, A, 157, 621—624).—Measurements have been made of the quantum yields of the decomp. of H_2O , D_2O , and NH_3 at various temp. The results for water indicate that the exchange does not take place appreciably by the dissociation and subsequent re-formation of H_2O mols. With NH_3 above 300°, the chain mechanism is the correct interpretation. L. L. B.

Mercury-photosensitised exchange reactions of deuterium with ammonia, methane, and water. A. FARKAS and H. W. MELVILLE (Proc. Roy. Soc., 1936, A, 157, 625—651).—The Hg-photosensitised exchange reactions of H_2 and D_2 with H_2O , NH_3 , and CH_4 have been investigated over a wide range of operating conditions. Variations have been made in (1) the time of reaction up to the establishment of equilibrium; (2) the temp. (30—600°); (3) the partial pressure of the components at a total pressure of 100 mm.; (4) the components (e.g., $\text{D}_2 + \text{NH}_3$ and $\text{H}_2 + \text{ND}_3$); (5) the intensity

of illumination. In each case the rate of the exchange reaction was compared with the abs. intensity of the light and the rate of the ortho-para conversion in order to obtain the stationary H or D atom concn. With CH_4 and NH_3 the exchange above 300° takes place according to: $\text{D} + \text{XH} \rightarrow \text{DX} + \text{H}$, followed by $\text{H} + \text{D}_2 \rightarrow \text{HD} + \text{D}$, and so on. Whereas the rates of the exchange reactions involving CH_4 and NH_3 are completely characterised by the corresponding energies of activation (13 and 11 kg.-cal., respectively), the exchange reaction involving H_2O proceeds much more slowly than would be expected from the apparent energy of activation (7 kg.-cal.). L. L. B.

Photochemical activity of the quartz mercury arc towards the reactions $\text{CO} + \text{O}_2$ and $\text{CO} + \text{NO}$. M. SISKIN, V. KONDRATEEV, and T. SUSCHKEVITSCH (J. Phys. Chem. Russ., 1936, 8, 281—289).—Filtration of the arc radiation through CO diminishes the rate of reaction. NO absorbs the active radiation as well and emits two series of the γ -band; the activation of NO is presumably produced by the line 2258.9 Å. and other weak lines. The dependence of the fluorescence of the O_2 on the pressure accords with Rasetti's theory (A., 1929, 866). J. J. B.

Critical number of quanta in photography. S. P. SCHUVALOV (J. Phys. Chem. Russ., 1936, 8, 387—402).—The probability of a single grain in a monodisperse uni-layer emulsion absorbing a certain min. no. of light quanta is calc. by statistical methods (Poisson's law). The results agree qualitatively with experiments on counting of grains after development. A method is indicated for determination of the min. no. of quanta absorbed by a grain which make its development possible. E. R.

Photometric measurements of X-ray reflexions. IV. Comparison of widely differing intensities. J. PALACIOS, P. DE LA CIERVA, and L. RIVOIR (Anal. Fís. Quím., 1936, 34, 743—747).—The blackening of "Agfa Laue" film by the K doublet of Ni \propto the time of exposure up to 0.6 blackening. The effect on an under layer of film is 1/3–13 that on the upper. The X-ray tube was automatically maintained at 7.5 ma. and 40 kv. by means of a special circuit (described). F. R. G.

[Photographic] sensitisation and desensitisation.—See B., 1937, 292.

Sensitisation of photochemical decomposition of iron pentacarbonyl in non-aqueous solution. F. P. FEDOROV and D. L. TALMUD (Acta Physicochim. U.R.S.S., 1936, 5, 727—728).—Preliminary. Addition of pinacyanol (1:50,000) to a xylene solution of $\text{Fe}(\text{CO})_5$ promotes its decomp. by red ($>640 \text{ m}\mu$) light. F. L. U.

Photochemical reactions in the fluorite region. I. Photochemical decomposition of ethylene. R. D. McDONALD and R. G. W. NORRISH (Proc. Roy. Soc., 1936, A, 157, 480—489).—Light from a H_2 lamp was passed into C_2H_4 through a fluorite window at pressures usually $<1 \text{ mm}$. A polymeride was deposited on the window, and H_2 and a condensable gas were formed, the latter being separable into one fraction evaporating at -170° to -160° and another at -140° to -130° at the low pressures involved.

The total pressure remained practically const. The variation of the rate of H_2 formation with the C_2H_4 pressure indicates that the light is not completely absorbed at the lowest pressures. L. L. B.

Photochemistry of polyatomic molecules. J. FRANCK and K. F. HERZFELD (J. Physical Chem., 1937, 41, 97—107).—It is deduced theoretically that the thermal energy can contribute much more than generally assumed to photochemical reactions of polyat. mols. able to emit fluorescent light. The application of this result to photosynthesis is discussed. J. W. S.

Oxidation of alpha-ray cuprene. S. C. LIND and C. H. SCHIFFLETT (J. Amer. Chem. Soc., 1937, 59, 411—413).—The reaction of cuprene (I) (prepared by polymerisation of C_2H_2 by means of Rn) with O_2 at room temp. has been followed manometrically and gravimetrically. The approx. reaction is $(C_2H_2)_{20} + 5.5O_2 \rightarrow C_{39}H_{40}O_{10} + CO$. The heat of combustion of $C_{39}H_{40}O_{10}$ is approx. 30% < that of (I). E. S. H.

Structural relations in solid reactions. J. PALACIOS and J. GARRIDO (Anal. Fís. Quím., 1936, 34, 739—742).—Reactions in crystals are classified chemically in four groups: no chemical change, loss or gain of substance, and replacement of some atoms by others. They are classified crystallographically according as the structure is retained in one, two, or three dimensions, or in isolated units. F. R. G.

Influence of organic materials on chemical corrosion of metals.—See B., 1937, 246.

Determination of corrosive power (aggressivity) of waters.—See B., 1937, 298.

Spectroscopic study of the thermal dissociation of $NaNO_2$, $HgNO_3$, and $Ba(NO_3)_2$. K. BUTKOV and V. TSCHASSOVENNI (Acta Physicochim. U.R.S.S., 1936, 5, 645—650).—Absorption spectra of vapours arising from heated $NaNO_2$, $HgNO_3$, and $Ba(NO_3)_2$ have been studied by means of the arrangement previously described (A., 1936, 1474). In no case is absorption due to the undecomposed mol. observed. $NaNO_2$, near its m.p. gives NO, but no NO_2 between 160° and 600° . $HgNO_3$ gives traces of NO at 40° , of NO_2 at 70° , and the resonance line Hg 2537 above 150° . $Ba(NO_3)_2$ shows NO and NO_2 at 590° . The appearance of lines due to NO when NO_2 is absent is attributed to dissociation of NO_2 at very low pressures. F. L. U.

Basic magnesium carbonates. (MME.) L. WALTER-LÉVY (Ann. Chim., 1937, [xi], 7, 121—224).—The account previously given (cf. A., 1932, 697) of the decomp. of $MgCO_3 \cdot 3H_2O$ on heating in sealed tubes between 100° and 200° to form magnesite (I) has been amplified (cf. also B., 1933, 345). Aq. solutions of $Mg(HCO_3)_2$, similarly heated, decompose at 100° into (I) and finally $MgCO_3$, but if heated in open vessels the $MgCO_3$ is hydrolysed to $Mg(OH)_2$. $MgCO_3 \cdot K_2CO_3 \cdot 4H_2O$ is decomposed by aq. K_2CO_3 or $KHCO_3$ at 100 — 200° forming (I) and two new basic carbonates, viz., $4MgO \cdot 3CO_2 \cdot 3H_2O$ and (provisionally) $8MgO \cdot K_2O \cdot 6CO_2 \cdot 6H_2O$. The first is formed in dil. solutions of K_2CO_3 and $KHCO_3$, and the second in

conc. solutions of K_2CO_3 . Addition of small quantities of K_2CO_3 to conc. solutions of $MgSO_4$ gives $4MgO \cdot 2CO_2 \cdot SO_3 \cdot 7H_2O$, $6MgO \cdot SO_3 \cdot 8H_2O$, and $4MgO \cdot SO_3 \cdot 11H_2O$ (cf. A., 1936, 689). The double decomp. of $MgSO_4$ and K_2CO_3 or $KHCO_3$ has been studied for varying concns. of the reactants. For equimol. proportions, (I) and brucite (II) are the dominant phases. There is no evidence for the formation of $MgCO_3$ or $4MgO \cdot 3CO_2 \cdot 3H_2O$ as a result of double decomp. in open vessels. Magnesia alba is considered to be a mixture of 3 mols. of (I) and 1 mol. of (II).

C. R. H.

Reaction between iodine and various metallic oxides. I. Magnesium oxide in aqueous media. II. Magnesium and calcium oxides in anhydrous media and in the dry condition. A. GIACALONE and R. INDOVINA (Annali Chim. Appl., 1936, 26, 489—494, 494—499).—I. Studies of the reaction between $MgSO_4$, NaOH, and I indicate that the red ppt. formed is due to adsorption of I on $Mg(OH)_2$ which, however, reacts slowly with I to give a coloured hypoiodite.

II. MgO or CaO with I in $CHCl_3$, CCl_4 , or C_6H_6 yields a red adsorption product but iodide and iodate (probably with hypoiodite as intermediary) are formed; similar reactions occur on mixing the dry oxides with I. F. O. H.

Hydrated compounds in the system $CaO-Al_2O_3-H_2O$ (liq.) and the hydration of anhydrous calcium aluminates. G. ASSARSON (Sverige geol. Undersök., Ser. C, Årsbok 30, No. 399, 1936, 202 pp.).—At low temp., solutions containing Ca aluminate and $Ca(OH)_2$ can deposit pure hydrated $CaO \cdot Al_2O_3$, and at higher temp. a series of higher Ca aluminates is formed together with Al hydroxide (n of which increases according to the temp. of pptn.). By shaking the low- CaO compounds with $Ca(OH)_2$ solution they are converted into hydrated tri- and tetra-aluminates. The invariant points could not be determined owing to the slowness of reaction. At 90° hydrated $3CaO \cdot Al_2O_3$ is the most stable compound and it can coexist with $Al(OH)_3$. The hydration of anhyd. compounds leads first to the production of hydrated $2CaO \cdot Al_2O_3$ and a gel the composition of which could not be ascertained. At higher temp. or in presence of much $Ca(OH)_2$ this gel resolves itself into hydrated $2CaO \cdot Al_2O_3$ and $3CaO \cdot Al_2O_3$. At lower temp. hydrated $CaO \cdot Al_2O_3$, and at higher temp. $Al(OH)_3$, may be formed. Conductivity and p_H measurements indicate that at low CaO contents, $CaO \cdot Al_2O_3$ is the principal compound existing in solution, and the mobility of the monoaluminate ion is 32. G. H. C.

Reduction of zinc oxide with hydrogen. F. SCHACHERL (XIV Congr. Chim. ind. Paris, 1935, Comm. 2, 3 pp.; Chem. Zentr., 1936, i, 2780; cf. A., 1933, 28).—Taylor and Starkweather's results were confirmed (cf. A., 1930, 1002). H_2O must be removed rapidly. H. J. E.

Mercurous fluoride. E. MONTIGNIE (Bull. Soc. chim., 1937, [v], 4, 342—344).—Reactions of Hg_2F_2 with many reagents are described. E. S. H.

Hydrates of aluminium perchlorate. E. MOLES and J. GONZÁLEZ DE BARCIA (Anal. Fís. Quím., 1936,

34, 802—812).— $\text{Al}(\text{ClO}_4)_3 \cdot 6\text{H}_2\text{O}$ over P_2O_5 at $35^\circ/0.001$ mm. gives the *trihydrate*, which at 145° yields the *anhyd. salt*. *d* are recorded for these and the compounds with $9\text{H}_2\text{O}$ and $15\text{H}_2\text{O}$, whence it is concluded that the hydrates are $\text{Al}(\text{ClO}_4)_3 \cdot x\text{H}_2\text{O}$. The existence of the $12\text{H}_2\text{O}$ compound (Dobroserdov *et al.*, A, 1927, 530) could not be confirmed.

F. R. G.

Thallium phosphide. E. MONTIGNIE (Bull. Soc. chim., 1937, [v], 4, 295—296).— Tl_3P is prepared by heating Tl and P in a sealed tube at 400° . No other Tl phosphides have been identified. The properties of Tl_3P are described.

E. S. H.

Total radiation in explosions of mixtures of carbon monoxide and air. V. I. BLINOV (J. Phys. Chem. Russ., 1934, 5, 1333—1352).—The total radiation during explosion of CO-air mixtures in narrow tubes is determined by the amount of CO_2 produced; max. vals. correspond with a stoichiometric mixture. Formulæ expressing radiation intensity in dry and moist mixtures are established.

CH. ABS. (p)

Silicon oxybromides. W. C. SCHUMB and C. H. KLEIN (J. Amer. Chem. Soc., 1937, 59, 261—264).—The prep. and properties of $(\text{SiOBr}_2)_4$, f.p. 123—123.5°, b.p. $155^\circ/7$ mm., Si_2OBr_6 , f.p. $27.9 \pm 0.1^\circ$, b.p. $118^\circ/15$ mm., $\text{Si}_3\text{O}_2\text{Br}_8$, f.p. $17.5 \pm 0.2^\circ$, b.p. $159^\circ/12$ mm., $\text{Si}_4\text{O}_3\text{Br}_{10}$, f.p. $-91 \pm 2^\circ$, b.p. $122^\circ/<0.5$ mm., and $\text{Si}_5\text{O}_4\text{Br}_{12}$, f.p. $-82 \pm 2^\circ$, b.p. $150^\circ/<0.5$ mm., are described. The existence of $\text{Si}_6\text{O}_5\text{Br}_{14}$ is indicated. The compounds are readily hydrolysed and completely miscible with CS_2 , CCl_4 , CHCl_3 , and SiBr_4 .

E. S. H.

Topochemical reactions. N. I. GLISTENKO (Kolloid. Shurn., 1936, 2, 249—254).—Pb tartrate, $(\text{BiO})_2(\text{OH})\text{NO}_3$, and Hg_2Cl_2 may, without changing their external form, be converted by aq. H_2S into PbS , Bi_2S_3 , and Hg_2S ; $\text{Hg}(\text{CN})_2$ and I in CHCl_3 also afford HgI_2 having the form of $\text{Hg}(\text{CN})_2$. The X-ray diagram of the sulphides is, however, normal.

J. J. B.

Nitrosyl of A. Angeli. G. ODDO (Ber., 1937, 70, [B], 412; cf. A., 1936, 460).—The experimental conditions employed by Cambi (A., 1936, 1350) differ from those used by the author.

H. W.

Phosphates of the type $\text{M}^{\text{II}}\text{NH}_4\text{PO}_4$. V. AUGER and (MLLE.) N. IVANOFF (Compt. rend., 1937, 204, 434—436).— $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$ at 100° in presence of NH_3 gives $\text{MgNH}_4\text{PO}_4 \cdot \text{H}_2\text{O}$; this decomposes at $>210^\circ$, giving a product which is highly incandescent on heating. $\text{CaNH}_4\text{PO}_4 \cdot 7\text{H}_2\text{O}$ gives CaHPO_4 at 100° . $\text{BaNH}_4\text{PO}_4 \cdot 7\text{H}_2\text{O}$ (prep. described) is similar. A pure Sr compound was not obtained. $\text{Cu}(\text{NH}_3)_2(\text{NH}_4)_4(\text{PO}_4)_2 \cdot 7\text{H}_2\text{O}$ (prep. described) gives $\text{CuNH}_4\text{PO}_4 \cdot \text{H}_2\text{O}$ in aq. solution at 35° .

A. J. E. W.

Condensed phosphoric acids. P. BONNEMAN (Compt. rend., 1937, 204, 433—434).—Schwarz's salt, $\text{Na}_5\text{P}_3\text{O}_{10} \cdot 6\text{H}_2\text{O}$ (A., 1895, ii, 445), was prepared by heating an equimol. mixture of $\text{Na}_4\text{P}_2\text{O}_7$ and Na_3PO_4 at 300° . The prep. of the salts $\text{Na}_3\text{CdP}_3\text{O}_{10} \cdot 12\text{H}_2\text{O}$ and $\text{Na}_2\text{CrP}_3\text{O}_{10} \cdot 6\text{H}_2\text{O}$ is described.

A. J. E. W.

Preparation of hypophosphoric acid from phosphorous acid. J. H. KOLITOVSKA (Z. anorg.

Chem., 1937, 230, 310—314).—When PBr_3 is hydrolysed in an ice-cold OAc' buffer at p_{H} 5.7, and the product oxidised by I in excess, 55% of the P is found as $\text{H}_4\text{P}_2\text{O}_6$ (cf. A., 1935, 715).

F. L. U.

Rose's phospham. H. MOUREU and G. WÉTROFF (Compt. rend., 1937, 204, 436—439; cf. A., 1936, 440, 810, 1476).—Previous work is discussed. P_4N_6 , not PN_2H , is formed on heating the product of the reaction of PCl_3 and NH_3 .

A. J. E. W.

Light of combustion of metals. J. A. M. VAN LIEMPT and J. A. DE VRIEND (Rec. trav. chim., 1937, 56, 126—128; cf. A., 1934, 972; 1935, 459).—Vals. for the light yield obtained on combustion in O_2 are: W, 9.0; Mo, 8.7; Ta, 32; Ce, 9.3; C, 1.9 lumens per watt. Wire-form specimens were used; ignition was effected electrically, or by chemical means.

A. J. E. W.

Dichlorine hexoxide. C. F. GOODEVE and F. D. RICHARDSON (J.C.S., 1937, 294—300; cf. A., 1936, 786).—The prep. of Cl_2O_6 from O_3 and ClO_2 is described. The m.p. is $3.50^\circ \pm 0.05^\circ$, and the v.p. in the range -40° to 20° is given by $\log_{10} p_{\text{mm.}} = -2070/T + 7.1$ for the liquid and $-2690/T + 9.3$ for the solid. Heats of evaporation and sublimation are calc. The heat of activation for the decomp. of the liquid is 22 ± 2 kg.-cal. The products of decomp. contain Cl_2 and Cl_2O_7 as well as ClO_2 and O_2 . The physical properties are tabulated and compared with those of the other Cl oxides.

F. L. U.

I_2O_5 and its hydrates. III. E. MOLES and P. VILLAN (Anal. Fis. Quím., 1936, 34, 787—801).—Contrary to Bahl *et al.* (A., 1935, 1334) I_2O_5 can be obtained only by thermal decomp. of HIO_3 or $3\text{I}_2\text{O}_5 \cdot \text{H}_2\text{O}$, and the supposed I_2O_4 is a mixture containing free HNO_3 . The following vals. of d^{18} are \propto the H_2O content: HIO_3 , 4.4662; $3\text{I}_2\text{O}_5 \cdot \text{H}_2\text{O}$, 5.055; I_2O_5 , 5.278.

F. R. G.

Complex rhenium oxycyanide. W. KLEMM and G. FRISCHMUTH (Z. anorg. Chem., 1937, 230, 215—219).—Addition of KCN in excess to conc. aq. K_2ReCl_6 , followed by oxidation with H_2O_2 , gives an orange solution which yields monoclinic crystals of the compound $\text{K}_3[\text{Re}^{\text{VO}}(\text{CN})_4]$. Physical and chemical properties are described.

F. L. U.

Ammoniates of rhenium trihalides. W. KLEMM and G. FRISCHMUTH (Z. anorg. Chem., 1937, 230, 209—214; cf. A., 1932, 988).—By isothermal degradation the following compounds have been prepared: ReCl_3 with 14, 7, and 6 mols.; ReBr_3 with 20, 14, 9, and 7 mols. NH_3 . Ammonolysis of the halides occurred above 100° . With ReCl_5 ammonolysis takes place at room temp.

F. L. U.

Complex cobaltammine perrhenates. E. NEUSER (Z. anorg. Chem., 1937, 230, 253—256).—The following compounds are described:

$[\text{Co}(\text{NH}_3)_6](\text{ReO}_4)_3 \cdot 1.5\text{H}_2\text{O}$;
 $[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}](\text{ReO}_4)_3 \cdot 3\text{H}_2\text{O}$ (I);
 $[\text{Co}(\text{NH}_3)_5\text{Cl}](\text{ReO}_4)_2$; $[\text{Co}(\text{NH}_3)_5\text{NO}_2](\text{ReO}_4)_2$;
 $[\text{Co}(\text{NH}_3)_4\text{C}_2\text{O}_4](\text{ReO}_4)_4$. The formation of (I) by mixing solutions of the roseo-chloride and a perrhenate on a microscope slide can be used to detect 1.4×10^{-6} g. of Re.

F. L. U.

Corrosion of iron. G. CHAUDRON and E. HERZOG (Bull. Soc. chim., 1937, [v], 4, 370—371).—Polemical (cf. A., 1936, 1218). E. S. H.

Preparation of pure ferrous chloride not containing ferric chloride. L. G. BERG (Zavod. Lab., 1936, 5, 235—236).—Fe and HCl are added to hot saturated aq. FeCl_2 (containing FeCl_3), the solution is filtered into a receiver containing 2—3 ml. of Et_2O , and the filtrate is cooled, when pure $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ crystallises. The solution is filtered in a CO_2 or Et_2O atm., and the crystals are dried in vac. R. T.

Amorphous and crystallised hydrated oxides and oxides. XXX. A rontgenographically amorphous and ferromagnetic ferric hydroxide of definite composition which does not age. Structure of ageing and non-ageing ferric hydroxides. A. KRAUSE, S. GAWRECH, and L. MIZGAJSKI (Ber., 1937, 70, [B], 393—401; cf. this vol., 89).—A non-ageing Fe^{III} polyorthohydroxide (I) is obtained by addition of 25% aq. NH_3 (15 c.c.) to $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (5 g.) in H_2O (100 c.c.) at 20° . One fourth of the well-washed gel (= about 0.25 g. Fe_2O_3) is suspended in H_2O (100 c.c.) and added rapidly to 100 c.c. of briskly boiling, CO_2 -free 2*N*-NaOH contained in a 1-litre flat-bottomed flask ("alborex" or "Eserco"). The flask is heated continuously with a powerful flame. The temp. falls temporarily to about 77° and rises in 1.5 min. to 103° at which it is maintained for 3 min., the H_2O lost being replaced by hot H_2O . The liquid is then decanted, and the ppt. filtered off and washed with warm or better with cold H_2O until the filtrate gives no reaction with phenolphthalein. $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ can also be used as initial material. Slight departures from this procedure can readily lead to failure. (I) is stable even with respect to H_2O content and retains this condition for years if preserved under H_2O or *N*-NaOH at 20° . Only the power of uniting with Ag and decomposing H_2O_2 catalytically diminish somewhat. Such subtle changes cannot be detected rontgenographically and the hydrogel remains amorphous. (I) is unchanged when boiled for many hr. with *N*-NaOH and only slightly altered by long boiling with H_2O in a Pt vessel or short treatment in an autoclave at 150° . The constitutional formula of (I) is discussed. H. W.

Walden inversion in substitution reactions on inorganic complex compounds. E. BERGMANN (J. Amer. Chem. Soc., 1937, 59, 423).—The reaction studied by Bailar *et al.* (this vol., 42) does not involve a substitution by ions; the theory previously proposed (A., 1933, 574; 1936, 803) does not make any prediction for such cases. H. B.

Action of nitric oxide on nickel carbonyl. H. REIHLEN (Z. anorg. Chem., 1937, 230, 223—224).—The formula assigned by Anderson (this vol., 95) to the green compound (A., 1930, 1539) formed from NO and $\text{Ni}(\text{CO})_4$ in MeOH is criticised. F. L. U.

Reduction of nickel and copper oxides with solid carbon. W. BAUKLOH and F. SPRINGORUM (Z. anorg. Chem., 1937, 230, 315—320; cf. B., 1931, 802).—Reduction of CuO or Cu_2O by C (graphite) is first noticeable about 550° , and of NiO or Ni_2O_3

about 800° . Reduction in the case of Cu oxides is superficial and never reaches 100%. With Ni oxides the course of the reaction is determined by diffusion of C through the Ni formed. F. L. U.

Reduction of ammonium ruthenate. Alkali ruthenium tetrahalides. II. M. BUIVIDAITE (Z. anorg. Chem., 1937, 230, 286—288).—The following salts are described: $\text{NH}_4\text{RuBr}_4 \cdot 2\text{H}_2\text{O}$; $\text{RbRuBr}_4 \cdot 4\text{H}_2\text{O}$; $\text{CsRuBr}_4 \cdot 4\text{H}_2\text{O}$. They resemble the corresponding Cl compounds (A., 1935, 594). F. L. U.

Progress in analytical chemistry with the use of complex compounds. E. TSCHIRCH (Chem.-Ztg., 1937, 61, 225—228).—A review.

Tswett's adsorption analysis (chromatographic analysis). W. KOSCHARA (Chem.-Ztg., 1937, 61, 185—188).—A review.

Theory of gravimetric analysis. E. SCHROER (Naturwiss., 1937, 25, 81—87).—A review of the physico-chemical conditions governing pptn., the occurrence and avoidance of impurities in ppts., ageing, and quant. separation. A. J. M.

Increasing the accuracy of micro-volumetric determinations. I. M. KORENMAN (Zavod. Lab., 1936, 5, 32—36).—The indicator error Δa is a function of the final vol. of the titrated solution, and of the nature of the indicator; it is equal to $2V - V_1$, where V is the vol. used for titrating a given vol. of solution, and V_1 is the vol. used for twice the concn., the amount of indicator and the final vols. of the solutions being const. The vals. of Δa are recorded for a no. of acidimetric indicators, and for iodometric and KMnO_4 titrations. R. T.

Adaptation of volumetric analysis to the Stakhanov movement. N. A. TANANAEV and I. N. LANGER (Zavod. Lab., 1936, 5, 1039—1042).—Considerable economy of time and reagents is effected, with the same accuracy, when the ordinary titrations are performed with vols. 0.1 of the usual. R. T.

Reactive groups in organic reagents and their application in inorganic analysis. L. A. SARVER (J. Chem. Educ., 1936, 13, 511—514).—A discussion. L. S. T.

Petrographic method of dust analysis.—See B., 1937, 297.

p_H indicators. C. E. MULLIN (Textile Col., 1935, 57, 518—520, 589—592, 668—670).—A summary of dyes used. CH. ABS. (e)

Standard solution for p_H measurements. A. K. AIROLA (Suomen Kem., 1937, 10, A, 19—21).—Aq. 0.01*N*- NaHCO_3 , saturated with CO_2 at various pressures, is suggested. A theoretical expression is derived. M. H. M. A.

Spectrophotometric determination of the p_H of a coloured medium (without standard). A. LECLERE (J. Pharm. Chim., 1937, [viii], 25, 117—122).—By means of the Zeiss step-photometer (a suitable light filter being employed) the extinction coeff. of the solution containing an indicator (Mered or bromothymol-blue) is determined. From a knowledge of the coeff. of the indicator on the acid

and alkaline sides of its range, the unknown p_H may then be calc. The modifications necessary in the case of a coloured liquid are described.

W. O. K.

[Determination of] p_H of electroplating solutions.—See B., 1937, 247.

Interferometric analysis of heavy water. N. S. FILIPPOV and M. M. SLUZKAJA (J. Phys. Chem. Russ., 1936, 8, 468—471).—A method for the determination of D_2O in mixtures with H_2O by measuring the refractivity with a Haber-Loewe interferometer is described.

E. R.

Potentiometric study of the reaction between solutions of halogens and sodium thiosulphate. C. DEL FRESNO and L. VALDÉS (Anal. Fis. Quím., 1936, 34, 813—817).—The reaction described by Beckurts ("Massanalyse," 1st ed., 1913, p. 262) cannot be used to determine Cl or Br owing to loss of these by evaporation.

F. R. G.

Use of potassium hydrogen sulphite in volumetric determinations. A. SCHWICKER (Z. anal. Chem., 1937, 108, 89—96).—(i) ClO_3' , BrO_3' , IO_3' , and IO_4' are determined by adding excess of $KHSO_3$, which is oxidised to $HSO_4' + Cl'$ (Br' etc.). The excess of $KHSO_3$ is bound by adding aq. CH_2O , and the HSO_4' is titrated with $NaOH$. Alternatively, the excess of $KHSO_3$ may be decomposed by boiling, and the Cl' formed may then be titrated with $AgNO_3$. (ii) H_2O_2 oxidises $KHSO_3$ to HSO_4' , which may be titrated with $NaOH$. (iii) For determination of CH_2O , $N-KOH$ is neutralised with $KHSO_3$ (thymolphthalein), a neutralised solution of CH_2O is added, and then $KHSO_3$ to restore neutrality. Alternatively $M-Na_2SO_3$ is acidified with a measured insufficient amount of $N-HCl$. The solution is then titrated with CH_2O until neutral (thymolphthalein).

J. S. A.

Volumetric determination of bromide after oxidation to bromate in presence of much chloride. I. M. KOLTNOFF and H. YUTZY (Ind. Eng. Chem. [Anal.], 1937, 9, 75—76).—Modified procedure is recommended. With 10 c.c. of 0.01M- Br' the accuracy is about 0.3%.

E. S. H.

Determination of bromide in mineral waters containing chloride and iodide. F. DI STEFANO (Annali Chim. Appl., 1936, 26, 515—518).—The H_2O is first freed from I' by HNO_3 and CS_2 , Na_2CO_3 and aq. Cl_2 are added, and the solution is evaporated to dryness, Br' thus being converted into BrO_3' . The residue is dissolved in H_2O , KI and HCl are added, and the liberated I (equiv. to the BrO_3' present) is titrated with 0.1N- $Na_2S_2O_3$.

F. O. H.

Indirect volumetric determination of bromate. I. VON STETINA (Z. anal. Chem., 1937, 108, 85—89).—To the bromate excess of 0.1N- As_2O_3 is added, and the solution is strongly acidified. The excess of As_2O_3 is then titrated back with 0.1N- $KBrO_3$.

J. S. A.

Catalytic determination of iodine. H. P. LUNDGREN (J. Amer. Chem. Soc., 1937, 59, 413—416).—Small amounts of I' can be determined by measuring the rate at which the decolorisation of methylene-blue by Na_2SO_3 proceeds in the presence

of I' as catalyst. Apparatus and procedure are described.

E. S. H.

Determination of oxygen in copper.—See B., 1937, 246.

Determination of colloidal and polysulphide sulphur in sulphurous waters. E. CHERBULIEZ and (MME.) A. HERZENSTEIN (Compt. rend., 1937, 204, 269—272).—Colloidal S is hydrolysed in alkaline solution to H_2S (determined as CdS) and alkali thiosulphate, which is determined iodometrically. S in polysulphides is converted into CdS and $S_2O_3^{2-}$ by an alkaline suspension of $Cd(OH)_2$ or $CdCO_3$. Results for five natural waters are given.

A. J. E. W.

Determination of sulphate, calcium, and magnesium in salt samples of high purity. A. C. SHUMAN and N. E. BERRY (Ind. Eng. Chem. [Anal.], 1937, 9, 77—79).—Modifications of standard procedures for determining SO_4^{2-} gravimetrically as $BaSO_4$, Ca volumetrically by $(NH_4)_2C_2O_4$ and $KMnO_4$, and Mg volumetrically by 8-hydroxyquinoline have been adapted to the analysis of $NaCl$. The precision obtainable is $\pm 0.0048\%$ for Ca and $\pm 0.0036\%$ for SO_4^{2-} and Mg.

E. S. H.

Determination of mixtures of [sodium] sulphite, thiosulphate, and carbonate. A. BRIAU (Ann. Chim. Analyt., 1937, [iii], 19, 38—40).—(a) $Na_2CO_3 + Na_2SO_3$ are determined acidimetrically. (b) $Na_2SO_3 + Na_2S_2O_3$ are titrated with I . (c) The acid formed in (b) is titrated with $NaOH$.

J. S. A.

Micro-determination of ammonia in presence of aliphatic amines. C. E. M. PUGH and J. H. QUASTEL (Biochem. J., 1937, 31, 282—285; cf. A., 1907, ii, 503).—The volatile amine and NH_3 in a special apparatus are passed, by aeration at 100° in presence of K_2CO_3 , into 0.1N- H_2SO_4 ; HgO , which combines with NH_3 but not with amines, is added, and the NH_3 after liberation from the pptd. complex with conc. aq. $NaOH$ is passed into 0.1N- H_2SO_4 and determined by nesslerisation. A blank determination is also made.

W. McC.

Detection and determination of ammonia in waters. N. D. COSTEANU (J. Pharm. Chim., 1937, [viii], 25, 101—103).—Strips of filter-paper impregnated with the H_2O to be tested and allowed to dry in the air are treated with a drop of Nessler's reagent. The yellowish-brown colour which develops is compared with that formed on comparison strips treated with standard solutions.

W. O. K.

Determination of small quantities of nitrous oxide and of carbon monoxide mixed with oxygen. Application to the determination of these substances in gaseous combustion products of nitrogenous substances. M. BADOCHÉ (Bull. Soc. chim., 1937, [v], 4, 232—239).— N_2O is separated by liquefaction and determined by combustion. CO is determined by reduction of I_2O_5 . The gaseous combustion products of certain org. N compounds contain CO (although in insufficient amount to affect the calc. heat of combustion), but no detectable N_2O .

E. S. H.

Rapid determination of small amounts of yellow in red phosphorus. A. A. KORINFSKI and

Z. F. GOLUBEVA (Zavod. Lab., 1936, 5, 23—24).—20 g. of red P are extracted (12 hr.) with 40 ml. of C_6H_6 , the suspension is filtered, a drop of filtrate is placed on $AgNO_3$ paper, and the intensity of the stain appearing is compared with those given by a series of standard yellow P solutions. R. T.

Determination of phosphorus in silver phosphate. N. RUBIN and W. N. McNABB (Analyst, 1937, 62, 123—124).—The P is pptd. as Ag_3PO_4 in presence of NaOAc, and after a wash with a saturated solution of Ag_3PO_4 it is dissolved in HNO_3 and the Ag^+ titrated with 0.1N-KI using 3 drops of 0.1N- $Ce(SO_4)_2 \cdot 2(NH_4)_2SO_4$ and 5 ml. of 0.5% starch as an internal indicator; the end-point is a permanent bluish-green colour. The max. error on 0.2 g. of KH_2PO_4 was —0.2 mg. J. G.

Volumetric determination of arsenic acid as ammonium arsenomolybdate. I. WADA, S. KITAJIMA, and J. TAKAGI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 133—146).— $(NH_4)_3AsO_4 \cdot 12MoO_3$ is pptd. by $(NH_4)_2MoO_4$ (I), and the ppt. is titrated with 0.1N-NaOH, as for P. 6 g. of NH_4NO_3 and 9 c.c. of conc. HNO_3 per 20 c.c. must be present, and (I) must be used in excess to ensure complete pptn. The influence of the concn. of NH_4NO_3 and HNO_3 on the wt. of the ppt. has been studied. R. S. B.

Adaptation of Gutzeit's method for the detection of arsenic to its determination in series experiments. K. UHL (Angew. Chem., 1937, 56, 164—165).—The test paper should be stretched by a rubber band over the plane-ground walls of the glass tube, which should be equally thick in all cases. Granulated Zn is preferable to Zn sticks and H_2SO_4 to HCl. Test paper prepared with 5% $HgBr_2$ in EtOH is considerably more sensitive than that obtained with $HgCl_2$. Direct sunlight must be avoided and reaction continued for 1.5 hr. at 25°. 2 or 3 samples of the substance must be used, preferably in different amounts. The distribution of As in solids is irregular; hence a relatively large sample should be taken. H. W.

Rapid determination of silica, by means of hydroxyquinoline, in quartzite, emery, or clay. M. I. VOLINETS and S. S. BERNSTEIN (Zavod. Lab., 1936, 5, 1071—1072).—0.25 g. of substance is fused with 2.5 g. of NaOH, the melt is extracted with 400 ml. of H_2O , the solution is heated at 90° with 42—47 ml. of conc. HCl, and the vol. is made up to 1 litre. 12.5 ml. of 20% $(NH_4)_2MoO_4$ are added to 100 ml. of solution at 60—65°, followed by 30 ml. of 1.6% hydroxyquinoline (I) in 34.5% HCl. The pptd. (I)-silicomolybdate complex is collected, washed with 0.016% (I) in 0.7% HCl, and dissolved in 200 ml. of 50% HCl. 8 g. of $H_2C_2O_4$ are added to the boiling solution, which is diluted to 500 ml., 35 ml. of 0.2N-NaBrO₃ are added, and excess of NaBrO₃ is titrated with 0.1N-Na₂S₂O₃. R. T.

(A) Micro-volumetric determination of silicic acid in soluble silicates. (B) Microchemical determination of silicic acid in presence of other substances. A. D. VOROBIEVA (Zavod. Lab., 1936, 5, 165, 166—167).—(A) The solution (in a paraffined flask) is made neutral with 0.01N-HCl,

and 2—8 ml. of 2.5% NaF in 25% KCl are added, followed by 1—55 ml. of 0.01N-HCl. 5—10 ml. of EtOH are added after 20 min., and excess of HCl is titrated. The sol. SiO_2 content is calc. on the basis of the equation $Na_2SiO_3 + 6NaF + 6HCl \rightarrow Na_2SiF_6 + 6NaCl + 3H_2O$. Trustworthy results are obtained for 0.14—7 mg. of SiO_2 .

(B) Fe^{III} and Al, but not Mn^{VI} , Cr^{III} , Mo^{VI} , W^{VI} , V^{V} , and Fe^{II} , interfere with the above method.

R. T.

Determination of quartz in presence of silicates. W. R. LINE and P. W. ARADINE (Ind. Eng. Chem. [Anal.], 1937, 9, 60—63).—The use of $HBFe_4$ in place of H_2SiF_6 (cf. Knopf, U.S. Publ. Health Rep., 1933, 48, 183) is recommended. $HBFe_4$ decomposes silicates, but has less action on SiO_2 than has H_2SiF_6 . SiO_2 can be determined with a precision of approx. 1% in mixtures with silicates.

E. S. H.

Determination of carbon dioxide in closed atmospheres. R. DUBRISAY and L. GION (XIV Congr. Chim. ind. Paris, 1935, Comm. 1, 2 pp.; Chem. Zentr., 1936, i, 2780).—The decolorisation of aq.-EtOH fuchsin solution by N_2H_4 is reversed by the presence of CO_2 . The reagent is shaken in a separating funnel with the air to be examined, and the colour matched against standards.

H. J. E.

Use of chemiluminescence of phosphorus in gas analysis. F. SCHACHERL (XIV Congr. Chim. ind. Paris, 1935, Comm. 2, 3 pp.; Chem. Zentr., 1936, i, 2721).—Tausz and Grolacher's method (A., 1931, 587) may be vitiated by traces of impurities.

H. J. E.

Detection of residues of hydrocyanic acid gas.—See B., 1937, 235.

Measurement of radon content of springs and other natural waters. W. KOSMATH (Arch. Hyg. Bakt., 1935, 114, 75—81; Chem. Zentr., 1936, i, 2603).—The Rn is removed in an air stream and measured with an electrometer.

H. J. E.

Determination of sodium. Removal of phosphorus before determining sodium by the uranyl zinc acetate method. O. R. OVERMAN and O. F. GARRETT (Ind. Eng. Chem. [Anal.], 1937, 9, 72—73).— PO_4''' is removed from the solution by treating with powdered $ZnCO_3$ and filtering. E. S. H.

Determination of lithium in sea-water. J. BARDET, A. TCHAKIRIAN, and (MLLE.) R. LAGRANGE (Compt. rend., 1937, 204, 443—445; cf. A., 1933, 927; 1934, 987).—Sea- H_2O from Roscoff contained 0.17 mg. Li per litre.

A. J. E. W.

Complete analysis of apatite rock.—See B., 1937, 236.

Simultaneous volumetric determination of calcium and magnesium. G. A. KORSHENIOVSKI (Zavod. Lab., 1936, 5, 24—26).—The solution is neutralised and AcOH is added, followed by 15 ml. of reagent [4 g. of $(NH_4)_2C_2O_4$ in 100 ml. of H_2O , mixed with 10 g. of Na_2HPO_4 in 10 ml. of AcOH]. The solution is heated at 100° for 30 min., 25 ml. of 10% aq. NH_3 are added, the solution is left overnight at room temp., the ppt. is collected, washed with 0.5% aq.

NH₃ and EtOH, dried, and suspended in H₂O. 0.1*N*-HCl is added, and the excess of HCl is titrated (1 ml. 0.1*N*-HCl = 2.016 mg. MgO). 25 ml. of 10% H₂SO₄ are then added, and the solution is titrated at 80° with 0.1*N*-KMnO₄. R. T.

Detection of barium ion in presence of phosphate ion. T. W. DAVIS and N. KORNBLUM (J. Chem. Educ., 1936, 13, 587).—Small amounts of Ba⁺⁺ are adsorbed on the pptd. phosphates and basic acetates in the usual PO₄^{'''} separation and escape detection. The ppt. is treated with Na₂O₂ to remove Al and Cr phosphates and Ba⁺⁺ is detected by pptn. with (NH₄)₂SO₄ in the HCl solution of the residual Fe salts. L. S. T.

Photo-electric determination [of barium and sulphate]. A. DEL CAMPO, F. BURRIEL, and L. G. ESCOLAR (Anal. Fis. Quím., 1936, 34, 829—834).—The course of pptn. of BaSO₄ in an agitated solution containing agar-agar is measured by an ammeter in a photo-electric circuit. Ba⁺⁺ and SO₄^{'''} may be determined within specified concns. F. R. G.

Determination of barium and lead. H. N. TERREM (Bull. Soc. chim., 1937, [v], 4, 259—264).—In absence of other metals, Ba and Pb can be determined by titration with Na hexametaphosphate. E. S. H.

Iodometric determination of magnesium. I. RIBAS and E. TAPIA (Anal. Fis. Quím., 1936, 34, 835—841).—Organo-Mg compounds are determined by a modification of the method of Job *et al.* (A., 1924, i, 24) using a large excess of 11% I in C₆H₆ in an atm. of N₂. The results are consistently 2% < by the method of Gilman *et al.* (A., 1926, 535). F. R. G.

Bearing of the reaction between iodine, alkali, and magnesium salts on analytical processes. A. GIACALONE and R. INDOVINA (Annali Chim. Appl., 1936, 26, 499—502).—The reaction between I, alkali hydroxide (I), and Mg⁺⁺ (cf. Augusti, A., 1933, 1024) is diminished by excess of OH⁻; the substitution of (I) by aq. Ca(OH)₂ is therefore recommended. F. O. H.

Micro-reactions of lead. I. M. KORENMAN and S. S. MESONSHNIK (Zavod. Lab., 1936, 5, 168—169).—The smallest amounts of Pb detectable by adding a drop of the given reagent to a drop of solution, and subjecting the crystals formed to microscopical examination, are: 5—8*N*-HCl 0.2 (Sn, Cu, and Bi interfere); 0.1—0.2*N*-KI 0.075 (Bi interferes); 0.25—1.0*N*-H₂SO₄ 0.02 (Ba and Sr interfere); cupriplumbinitrite reagent [equal vols. of 30% AcOH, saturated aq. KNO₃, Cu(OAc)₂, and NH₄OAc] 0.009 × 10⁻⁶ g. (Sn^{II}, but not Sn^{IV}, interferes). R. T.

Rapid determination of lead. L. M. JOLSON and E. M. TALL (Z. anal. Chem., 1937, 108, 96—105).—Metallic Pb is pptd. by Al foil at 100° from a solution containing <0.05 g. of Pb and >2 c.c. of conc. HCl in 15 c.c. The Pb is dissolved in 25% HNO₃, neutralised with aq. NH₃, and titrated at 80° in AcOH solution with aq. (NH₄)₂MoO₄, with tannin as external indicator. Cu, Sb, Bi, As, and Sn are pptd. with the Pb. As, Sn, and <0.02 g. of Cu in 15 c.c. do not affect the titration; Sb and Bi cause high results. In presence of >0.02 g. of Cu, titration

with (NH₄)₂MoO₄ is not possible. Oxidised ores, concentrates, etc. are evaporated down with conc. HCl, dissolved in dil. HCl, and treated as above. Sulphide ores etc. are first treated with conc. HCl and evaporated down. The residue is treated with NH₄Cl, and Pb determined in the filtrate. J. S. A.

Accuracy and cost of determination of lead by various methods. L. M. JOLSON (Zavod. Lab., 1936, 5, 1196—1201).—Jolson and Tall's method (preceding abstract) is recommended. R. T.

Bromopotentiometric determination of thallium with chloramine-T. O. DEL FRESNO and A. AGUADO (Anal. Fis. Quím., 1936, 34, 818—822).—The reaction used in the volumetric method of Berry (A., 1935, 56) has been adapted to potentiometry. Tl may thus be determined with an error >1%. F. R. G.

Conductometric study of the reaction between the cupric ion and potassium ferrocyanide. J. IBARZ and A. FEYTO (Anal. Fis. Quím., 1936, 34, 823—828).—Two points of inflexion are obtained of which the first is used to determine Cu⁺⁺, as within certain limits it is independent of concn. and temp.; it corresponds with 1.1 equiv. Fe(CN)₆^{'''}. A second point of inflexion is attributed to adsorption of Fe(CN)₆^{'''} by the ppt. F. R. G.

Applications of confined spot tests in analytical chemistry. H. YAGODA (Ind. Eng. Chem. [Anal.], 1937, 9, 79—82).—In the technique described, the spot test is confined within a uniform area of definite cross-section, by the aid of a H₂O-repellent barrier embedded in the fibres of the paper. By this means, Cu and Ni can be determined in their salts with an accuracy of 1—3%. E. S. H.

Electrometric methods of determining rare earths. G. JANTSCH (Österr. Chem.-Ztg., 1937, 40, 77—80).—In addition to potentiometric titration with H₂C₂O₄ (cf. this vol., 149), small amounts of rare earths may be titrated conductometrically, in about 0.5% solution, against NaOH or Na₂C₂O₄ at 70—90°. J. S. A.

Colorimetric determination of aluminium in water.—See B., 1937, 298.

Polarographic determination of iron. S. G. MICHLIN (Zavod. Lab., 1936, 5, 1167—1170).—Fe^{II} is determined polarographically, at *pH* 5—6, in presence of tartaric acid; Al does not interfere. R. T.

Determination of iron. Colorimetric o-phenanthroline method. L. G. SAYWELL and B. B. CUNNINGHAM (Ind. Eng. Chem. [Anal.], 1937, 9, 67—69).—The red colour produced by Fe⁺⁺ and o-phenanthroline has been adapted to the determination of small amounts of Fe in biological or inorg. substances. Results given for wines show that when [Fe] is <5 p.p.m. the accuracy is about 10%. Cu in concns. twice that of Fe, and Al and Mg up to 10 times that of Fe, do not interfere. E. S. H.

Micro-magnetic determination of iron and its application to biology. C. COURRY (Bull. Soc. chim., 1927, [v], 4, 311—324).—Technique is described. E. S. H.

Micro-determination of nickel. I. M. KORENMAN, A. L. TENENBAUM, and S. M. LIALIUSCHKO (Zavod. Lab., 1936, 5, 1051—1053).—30—40 ml. of 3% $\text{Na}_2\text{P}_2\text{O}_7$, followed by aq. NH_3 to a slightly alkaline reaction, are added to 1—10 ml. of solution, containing 0.02—5 mg. of Ni. Starch solution, AgNO_3 , and KI are added, and the solution is titrated with 0.1N-KCN, according to Moore (A., 1895, ii, 534). The method is applicable in presence of >40 mg. of Fe or Zn, 60 mg. of Mn, and 30 mg. of Cr. R. T.

Chemical analysis by X-rays. I. P. DE LA CIERVA and L. RIVOIR (Anal. Fís. Quím., 1936, 34, 770—778).—Precautions necessary to detect 10^{-6} g. of Ni in Zn are described. By employing the coeff. of weakening through successive films (cf. this vol., 193) of the blackening due to X-rays to determine the const. in Glocker's formula (A., 1927, 999; see also Tellez Plascencia, A., 1936, 926), Mn in steel may be determined. F. R. G.

Colorimetric determination of tungsten and cerium. F. M. SCHEMJAKIN, A. V. VESELOVA, and M. I. VLADIMIROVA (Zavod. Lab., 1936, 5, 231—232).—2 ml. of approx. 0.01N-tungstate solution and 2 ml. of 0.1N- CuSO_4 are added to 6 ml. of H_2O , the solution is heated at 74—75° for 30 min., cooled to 17°, filtered, and the ppt. of Cu tungstate is washed with 80% EtOH, and dissolved in 10 ml. of 28% HCl. The coloration of the solution is compared with that of standard Cu solutions. Minor modifications of Schemjakin's method for determination of Ce (A., 1935, 464) are described. R. T.

Separation of small amounts of tin from arsenic and antimony. N. I. TSCHERVIKOV and E. A. OSTROUMOV (Zavod. Lab., 1936, 5, 1173—1176).—The acid solution, containing tartaric acid and group IV and V cations, is made neutral with NaOH, and poured into hot 4% aq. Na_2S , and the solution is filtered from group IV sulphides. As, Sb, and Sn sulphides are pptd. from the acidified filtrate. The washed ppt., suspended in 80—100 ml. of H_2O , is dissolved by adding 2 g. of KOH per 0.1 g. of As + Sb + Sn. H_2O_2 (1 ml. $>$ required to oxidise the sulphides) is added, and the solution is boiled for 15 min. Me-red is added, followed by HCl to a red colour, after which 8 ml. of conc. HCl are added per 100 ml. of solution. Excess of 5% aq. cupferron is added to the solution at 3—5°, the ppt. is collected, washed with 0.05% cupferron at 5°, ignited with HNO_3 , and weighed. Good results are obtained for 0.3—30 mg. of Sn, in presence of considerably greater amounts of Sb and As. R. T.

Photometric determination of titanium and vanadium in steel and iron.—See B., 1937, 246.

Phenylanthranilic acid as a redox indicator. V. S. SIROKOMSKI and V. V. STEPIN (Zavod. Lab., 1936, 5, 144—147).— $\text{o-NHPh}\cdot\text{C}_6\text{H}_4\cdot\text{CO}_2\text{H}$ (I) has a normal oxidation potential of +1.08 volts; its solutions exhibit a colour change from colourless to violet in presence of excess of $\text{Cr}_2\text{O}_7^{2-}$ or MnO_4^- . (I) can be used in place of phenanthroline indicators in the volumetric determination of V, Au, Tl, Cr, Mn, Ce, and Co. R. T.

Gravimetric determination of vanadium and uranium by means of ammonium benzoate and salts of other organic acids. F. M. SCHEMJAKIN, V. V. ADAMOVITSCH, and N. P. PAVLOVA (Zavod. Lab., 1936, 5, 1129—1131).—Aq. $(\text{NH}_4)_2\text{S}$ is added to 0.1 g. of NH_4VO_3 in 35 ml. of 0.6N-HCl, at the b.p., and 12 ml. of 8% NH_4 cinnamate are added. The ppt. of V^{IV} cinnamate is collected after 3—4 hr., washed with aq. cinnamic acid, ignited, and the residue of V_2O_5 is weighed. 4 ml. of 0.05N- NH_4OBz and 1 ml. of 10% aq. NH_3 are added per ml. of 0.05N- UO_2 salt (both solutions at the b.p.). The ppt. is collected, washed with 2% NH_4NO_3 (made alkaline with NH_3), and ignited, and the residue of U_3O_8 is weighed. Na_2CO_3 ($>0.05\text{N}$), Al, Cr, and Fe alums, $\text{Th}(\text{NO}_3)_4$, and Na_2HPO_4 , but not $\text{Ca}(\text{NO}_3)_2$, interfere with determination of U by this method. R. T.

apoMorphine as redox indicator in determination of antimonite ion with potassium bromate. L. SZEDELLEDY and K. SIK (Z. anal. Chem., 1937, 108, 81—85).— SbO_3^{3-} is titrated with KBrO_3 at 45—50°, the solution being acidified to contain 5% of HCl. 0.3 c.c. of 0.1% aq. apomorphine is added, giving a rose-red coloration at the end-point. J. S. A.

Detection and determination of gold in solutions. N. D. COSTEANU (Bul. Fac. Ştiinţe Cern., 1935, 8, 68—70; Chem. Zentr., 1936, i, 2785).—Filter-papers soaked in aq. tannin give a blue colour with Au solutions. Quant. vals. are obtained with paper soaked in SnCl_2 , and a series of comparison solutions. Ag, if present, gives AgCl which fluoresces in ultra-violet light. H. J. E.

Detection and determination of traces of gold in presence of copper. L. M. KULBERG (Zavod. Lab., 1936, 5, 170—175).—5—6 g. of reagent 0.5 g. of leuco-nitrobrilliant-green are dissolved in 5 ml. of 80% AcOH, 15 ml. of H_2O are added, and the solution is boiled for 3—4 min. and extracted with CHCl_3 until colourless) are added to 2—3 ml. of solution, which is boiled for 2 min.; a blue coloration appears in presence of $\leq 5 \times 10^{-7}$ g. of Au. In presence of coloured ions, Au can be detected by extracting the solution with CHCl_3 , which becomes coloured blue. The procedure is applied to the colorimetric determination of Au (0.005—0.1 mg.). R. T.

Application of Feigl's drop reactions to the analysis of assay beads. R. JIRKOVSKY (Chem. Listy, 1937, 31, 37—38).—Au, Ag, Cu, Pb, Fe, Sb, Bi, and Zn are readily detected by Feigl's drop reactions. R. T.

Temperature correction in micro-m.p. determination. H. T. LIEM (Pharm. Tijds. Ned.-Ind., 1935, 12, 337—339; Chem. Zentr., 1936, i, 2777).—A claim for priority. H. J. E.

Heat transfer in calorimetry. J. M. STURTEVANT (Physics, 1936, 7, 232—235).—Mathematical. The lags in heat transfer have been investigated in a medium of finite thermal conductivity enclosed in an infinitely long perfectly conducting cylindrical case when heat is introduced uniformly into the case, and when heat is evolved uniformly within the medium. J. G. A. G.

Determination of thermal diffusivities. C. STARR (Rev. Sci. Instr., 1937, [ii], 8, 61—64).—A sinusoidal temp. is impressed on one end of a wire specimen, and the thermal diffusivity is determined from the measured decrement of the temp. wave travelling along it. C. W. G.

Apparatus for heating and opening sealed tubes. J. F. DURAND and Y. R. NAVES (Bull. Soc. chim., 1937, [v], 4, 305—306).—A safety device is described. E. S. H.

Vacuum furnace for the production of large refractory metal single crystals. H. E. FARNSWORTH (Physical Rev., 1935, [ii], 48, 972).—A Ni single crystal 0.75 in. in diameter and 2 in. long has been obtained. L. S. T.

Cold laboratory. L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, Spec. No., June, 1936, 1—5).—The equipment of the low-temp. laboratory at the Ukrainian Physico-Technical Institute is described. J. W. S.

Role of spectrophotometry in colorimetry. M. G. MELLON (Ind. Eng. Chem. [Anal.], 1937, 9, 51—56).—A discussion. E. S. H.

Anomalous diffraction gratings. II. U. FANO (Physical Rev., 1937, [ii], 51, 288; cf. A., 1936, 1355).—Theoretical. N. M. B.

Fluorometer. L. BRUNINGHAUS (Compt. rend., 1937, 204, 118—120).—Gaviola's apparatus for measuring the rate of extinction of fluorescence (A., 1926, 335) is modified by the use of birefringent quartz plates instead of Kerr cells. A. J. E. W.

Optical microvibrometer. L. S. SCHMUSCHKOVITSCH (Zavod. Lab., 1936, 5, 98).—Apparatus is described. R. T.

Simple projector for measuring weak spectral lines. A. SIMON and F. FEHÉR (Z. anorg. Chem., 1937, 230, 308—309). F. L. U.

Microscopy with ultra-violet light. J. E. BARNARD and F. V. WELCH (J. Roy. Microscop. Soc., 1936, [iii], 56, 365—371).—A survey of the progress and simplification of technique and a description of a new apparatus. N. M. B.

Fluorescence microscopy with high powers. J. E. BARNARD and F. V. WELCH (J. Roy. Microscop. Soc., 1936, [iii], 56, 361—364).—A visible light, or fluorescence image, may accompany and hinder the formation of an image in the unaltered λ of the incident radiation. The merits of various sources of ultra-violet illumination for obtaining a fluorescent image are examined, and the use of a high-tension discharge between Mg electrodes to give a small area of high and uniform intensity is described. N. M. B.

Technique for making Schumann plates. P. N. KALIA (Indian J. Physics, 1936, 10, 457—462).—Modified technique for laboratory use in hot and humid climates is described. O. D. S.

Apparatus for "optical" demonstration of some geometrical features of electron diffraction photographs. W. G. BURGERS and J. J. A. PLOOS VAN AMSTEL (Z. Krist., 1936, 95, 54—73).—By replacing the sphere of reflexion (if of large radius)

by a flat sheet of light, and representing the reciprocal lattice as a set of white highly-reflecting points on a system of wooden rods on an otherwise dark background, the chief features of many types of electron diffraction photographs can be displayed.

B. W. R.

Appliance for evaluating Debye diagrams and determination of parameters. S. L. NUDELMAN (Zavod. Lab., 1936, 5, 192—195). R. T.

Influence of error of centring of samples on the accuracy of determination of the constant in the Debye-Scherrer method. A. I. KRASNIKOV, D. A. ORECHOV, and A. D. SCHULENINA (Zavod. Lab., 1936, 5, 1103—1105).—The importance of exact centring of sections is established. R. T.

X-Ray defectoscope. V. VEKSLER, A. BIBERGAL, B. ISAIEV, and V. CHRUSCHTSHEV (Zavod. Lab., 1936, 5, 1108—1111).—Apparatus and methods are described. R. T.

Separation of the characteristic from the continuous X-ray spectrum. M. A. BLOCHIN (Zavod. Lab., 1936, 5, 1126).—Structural modifications eliminating continuous spectra are described. R. T.

Comparator for measurement of roentgenograms. A. D. EVSEEV (Zavod. Lab., 1936, 5, 1128).—An instrument is described. R. T.

Preferred conditions for taking X-ray photographs. E. A. W. MÜLLER (Arch. Eisenhüttenw., 1936—7, 10, 267—273).—Graphs are constructed for determining the time of exposure of the specimen according to its thickness and d , the voltage of the X-ray tube, the sensitivity of the film and intensifying foil, and the distance between the film and the tube in examining steels for porosity and slag inclusions. A. R. P.

Photo-electric cell. G. A. BOUTRY (Compt. rend., 1937, 204, 120—122).—Causes of lack of proportionality between photo-electric current and the incident light flux are discussed, and the construction of an improved cell is described. A. J. E. W.

Limits of performance of selenium barrier-layer cells. H. KÖNIG (Helv. phys. Acta, 1935, 8, 505—507; Chem. Zentr., 1936, i, 2704—2705).—An accuracy of 1—2% in comparing light sources is obtainable by a suitable choice of filters. H. J. E.

Behaviour of electrolytic oxide layers. R. STÖRMER (Z. tech. Physik, 1935, 16, 508—513; Chem. Zentr., 1936, i, 2705—2706).—The Al cell shows a lag which is not observed in a Cu_2O cell, and is attributed to the absorption or setting free of O.

H. J. E.

Neutron generator. A. BOUWERS, F. A. HEYN, and A. KUNTKE (Physica, 1937, 4, 153—159).—A modified form of Oliphant and Rutherford's apparatus (A., 1933, 883) and a cascade type high-tension generator are described. H. J. E.

Counting of electrons by means of a discharge tube. J. H. GISOLF (Physica, 1937, 4, 69—70).—Certain commercial discharge tubes (e.g., a Philips Ne-filled telephone signal tube) will respond to γ - and to β -rays. H. J. E.

High-sensitivity mass spectrograph with automatic recorder. P. T. SMITH, W. W. LOZIER, L. G. SMITH, and W. BLEAKNEY (Rev. Sci. Instr., 1937, [ii], 8, 51—55).—A motor-driven continuously variable potentiometer is synchronised with a moving photographic plate, and the position of a spot of light reflected from a galvanometer is recorded as a function of the potential applied by the potentiometer. C. W. G.

Apparatus and experiments for instruction in potentiometric measurements. J. G. MILLER and W. W. LUCASSE (J. Chem. Educ., 1936, 13, 581—585).—A potentiometer, H_2 generator, and calomel electrode are described. The titration of NaOBz with HCl and of NH_4Cl with NaOH is discussed in detail. L. S. T.

Testing of details by means of magnetic powders. A. V. SHIGADLO and L. E. PEVZNER (Zavod. Lab., 1936, 5, 182—187).—The application of known methods is discussed. R. T.

Reducing vibration of analytical balances. I. S. SACHIEV (Zavod. Lab., 1936, 5, 99).—Vibration is greatly reduced by placing the balance on a glass plate resting on a layer of rubber sponges. R. T.

Saturation by water in gas-analysis compensators. J. R. BRANHAM (J. Res. Bur. Stand., 1937, 18, 59—67).—The effects of convection, diffusion, and evaporation of H_2O from the glass surface in the compensators used in volumetric gas analysis are discussed. Serious errors may result when, for thermal similarity, the compensator used is of the same shape as the bulbed burette. J. W. S.

Device for reading burettes. V. A. ASTAFIEV (Zavod. Lab., 1936, 5, 1136). R. T.

Analysis of gas mixtures by determination of density by the gas balance method. P. Z. BURDO and I. P. ISCHKIN (Zavod. Lab., 1936, 5, 1073—1078).—Known methods are described. R. T.

Determination of the instantaneous radon content of the open air in the neighbourhood of the earth's surface, and the vertical distribution of radon in the atmosphere. W. KOSMATH (Physikal. Z., 1937, 38, 82—83).—A portable apparatus, employing adsorption of Rn by coconut C and subsequent desorption, is described. A. J. M.

Microviscosimeter for non-Newtonian liquids. G. W. S. BLAIR (Kolloid-Z., 1937, 78, 231).—Errata in a recent paper (this vol., 101) are corr. F. L. U.

Principle of the suspended level. Applications to the measurement of viscosity and other properties of liquids. L. UBBELOHDE (Ind. Eng. Chem. [Anal.], 1937, 9, 85—90).—The construction and use of the suspended-level viscosimeter are described. E. S. H.

Support for perforated platinum crucibles. W. M. THORNTON, jun., and J. G. SMITH (Ind. Eng. Chem. [Anal.], 1937, 9, 95). E. S. H.

Rapid cleaning of mercury. H. F. EASLY (Ind. Eng. Chem. [Anal.], 1937, 9, 82).—Hg is cleaned by shaking with $Hg_2(NO_3)_2$ and H_2O . E. S. H.

Preparation of semipermeable membranes. A. GRUMBACH and P. VIDAL (Compt. rend., 1937, 204, 237—239).—A $Cu_2Fe(CN)_6$ membrane is deposited in a sintered glass plate having its pores partly filled with gelatinous SiO_2 . A. J. E. W.

Small continuous still.—See B., 1937, 196.

Determination of solubility of gases in pure liquids or solutions by the Van Slyke-Neill manometric apparatus. F. S. ORCUTT and M. H. SEEVERS (J. Biol. Chem., 1937, 117, 501—507).—The Van Slyke correction for residual gas not expelled from the liquid is eliminated by an adaptation of technique and calculation. R. M. M. O.

Automatic control of corrosive fluids. M. M. FAINBERG (Zavod. Lab., 1936, 5, 7—12, 136—142).—Appliances for automatic measurement and delivery are described. R. T.

High-vacuum cut-off. O. H. SCHMITT (Rev. Sci. Instr., 1937, [ii], 8, 68—69).—A steel "hat" dropping on to an annular Hg seal is manipulated by means of an external magnet. C. W. G.

Model correlating four variables. M. D. SCHMID (Rev. Sci. Instr., 1937, [ii], 8, 69).—By means of Me_2O vapour sheets of celluloid are caused to collapse over plaster moulds protected by oiled paper. The moulds are removed and the sheets mounted on three-dimensional axes. C. W. G.

Modification of the Bunsen apparatus, and its application. N. U. KAZAKOV (Zavod. Lab., 1936, 5, 1135—1136).—Apparatus is described. R. T.

Electrically driven ultracentrifuge. J. W. BEAMS and L. B. SNODDY (Science, 1937, 85, 185—186). L. S. T.

Ultrafiltration apparatus. G. L. ABKIN and S. M. LIEPATOV (Kolloid. Shurn., 1936, 2, 85—87).—Apparatus is described. R. T.

Transparent mounting for micro-sections. E. A. ERDMAN (Met. & Alloys, 1937, 8, 27).—The technique of the use of Me methacrylate as a mounting medium for small metallurgical specimens is described. A hydraulic press similar to that used for mounting specimens in bakelite is required. The mounting is tough, hard, resistant to etching reagents, adheres excellently to the specimen, and is as transparent as glass. A. J. K.

Carbon dioxide "generator." C. R. CONARD (J. Chem. Educ., 1936, 13, 539—540).—An arrangement for the use of solid CO_2 as a source of supply of gas is described. L. S. T.

Density and surface tension by the capillary elevation method. L. E. DODD (Physical Rev., 1935, [ii], 48, 487).—In order to avoid temp. difficulties in weighing, capillary elevations under a range of gas pressures are determined. The consts. of the linear curve so obtained enable both d and γ to be computed. L. S. T.

Laboratory stirrer and m.p. bath. L. S. KEYSER (J. Chem. Educ., 1936, 13, 590—591). L. S. T.

Automatic gas generator. I. FINE (J. Chem. Educ., 1936, 13, 588—589). L. S. T.

Apparatus for diffusion measurements. N. S. SCHEINKER (*Acta Physicochim. U.R.S.S.*, 1936, 5, 729—738; cf. A., 1935, 1072, 1201).—Improvements in design, whereby a sharp interface between solvent and solution is obtainable, are described. F. L. U.

Multiple-column mercury manometer. J. R. ROEBUCK and W. CRAM (*Physical Rev.*, 1935, [ii], 48, 474). L. S. T.

Manometer for low gas pressures, particularly between 10^{-3} and 10^{-5} mm. F. M. PENNING (*Physica*, 1937, 4, 71—75).—The pressure is deduced

from the current through a glow discharge tube in a magnetic field, or, less exactly, from the length of the negative glow on a rod-shaped cathode. H. J. E.

Aluminium reduction experiments. R. A. KARGES (*J. Chem. Educ.*, 1936, 13, 593).—Reduction of MnO_2 and sand to Mn and cryst. Si, respectively, is described. L. S. T.

Early history of Liebig's laboratory. H. G. GOOD (*J. Chem. Educ.*, 1936, 13, 557—562). L. S. T.

Geochemistry.

Chemical exploration of the stratosphere. F. A. PANETH (*Nature*, 1937, 139, 180—182, 220—223).—A lecture. L. S. T.

Heavy water content of atmospheric moisture. K. OKABE and T. TITANI (*Bull. Chem. Soc. Japan*, 1937, 12, 11—15).—22 samples of atm. moisture condensed and purified by several distillations were $1-7 \times 10^{-6}$ g. per g. lighter than Osaka conductivity H_2O . C. R. H.

Applications of the polarimetric method to the study of the upper layers of the atmosphere. I. A. CHVOSTIKOV and A. N. SEVTSCHENKO (*Compt. rend. Acad. Sci. U.R.S.S.*, 1936, 4, 359—363).—Measurements of the polarisation of the light diffused from the sky indicate ionised layers at altitudes of approx. 95 and 135 km. at dawn, and 80, 115, and 150 km. at dusk. The results are discussed with reference to the altitude of the Heaviside layer. J. G. A. G.

Constancy of the atmosphere with respect to carbon dioxide and oxygen content. T. M. CARPENTER (*J. Amer. Chem. Soc.*, 1937, 59, 358—360).—Analysis of 1156 samples of air showed an average content of 0.031% CO_2 and 20.939% O_2 . Variations in season or proximity of fuel combustion do not cause measurable differences in these vals. E. S. H.

Coal dust and rock dust as constituents of the atmosphere. M. STIPANITS (*Berg-huttenmann. Jb. montan. Hochschule Leoben*, 1935, 83, 77—92; *Chem. Zentr.*, 1936, i, 2402).—Concns., microscopic analyses, and settling phenomena of surface and mine dusts, sampled on a cotton-wool filter, are described. Atm. dust is colloidal in nature, its stability being dependent on particle size and electric charge. Colloid aspects of dust explosions are discussed. J. S. A.

Waters of the "dry" region of N.E. Brazil. I. F. W. FREISE (*Chem. Erde*, 1937, 11, 45—72).—Many analyses of waters from rivers, ponds, and springs are given. L. J. S.

Acetous Ostian water from the Laurentine Way near Rome. M. TALENTI and A. RAGNO (*Annali Chim. Appl.*, 1937, 27, 18—30).—Chemical and physico-chemical analysis of the H_2O , which is radioactive and contains Na^+ , K^+ , Ca^{++} , Mg^{++} , Fe^{++} , Cl^- , SO_4^{--} , HCO_3^- , SiO_2 , and CO_2 , has been made.

κ , calc. from the partial conductivities of the individual ions by the Porlezza method (A., 1924, ii, 603), agrees closely with that determined experimentally. L. A. O'N.

Waters of Eritrea. C. TOFFOLI (*Annali Chim. Appl.*, 1937, 27, 30—52).—Chemical and physico-chemical analyses of the waters have been made. H_2O from the high plain, in contact with basaltic rocks, and H_2O from the lower eastern plain are salt and highly mineralised, the former containing appreciable NO_3^- . H_2O , from the high plain in cryst. schists, and from the high plain and lower western plain in the granite zone, are less mineralised; the first-named is usually turbid, the turbidity being in inverse ratio to the mineralisation, and contains Mn in suspension. The thermal H_2O of Sabarguma, temp. 50—66°, is radioactive and contains Na^+ , Cl^- , and HCO_3^- . L. A. O'N.

Chemical and physico-chemical analysis of the mineral water of Fontevivo (Parma). U. SBORGI, A. GALANTI, and Z. CONTINI (*Annali Chim. Appl.*, 1936, 26, 502—515).—Data are tabulated. Spectrographic and colorimetric photo-electric methods and the quant. separation of small amounts of Br^- from large quantities of Cl^- are described. F. O. H.

Oceanographical observations of Simoda Bay, Izu Peninsula. S. YOSHIMURA (*Sci. Rep. Tokyo Bunrika Daigaku*, III, 1936, 1, 127—155).—Salinity, temp., O_2 content, and p_H are recorded. C. W. G.

Radioactivity of bottom sediments. I. Radioactivity of ferromanganese formations in seas and lakes of the U.S.S.R. L. M. KURBATOV (*Amer. J. Sci.*, 1937, [v], 33, 147—153).—Data for sediments from 9 sources are given and discussed. The range of results is: Ra content $(1.2-31.8) \times 10^{-10}\%$; emanating power 31.0—70.1%; Th-X content $(1.6- <1.0) \times 10^{-3}\%$. N. M. B.

Arsenic content of ocean bed samples of the Atlantic "Meteor" expedition. B. F. VON BULOW (*Ann. Hyd. marit. Met.*, 1935, 395—397; *Chem. Zentr.*, 1936, i, 2523).—Data for 57 samples are recorded (mean As content 0.0004%). H. J. E.

Spectroscopic examination of meteorites. A. S. KING (*Astrophys. J.*, 1936, 84, 507—516).—Spectrograms of 4 Ni-Fe, 8 stony, and one graphite type show that of the 32 elements identified > half are

not usually detected in chemical and mineralogical analyses; some consist of the rarer elements. Estimates of the abundances of the elements agree essentially with those found chemically by Noddack and Noddack (A., 1930, 1341). The differences in composition of Fe and stony meteorites are discussed. The band spectra of meteoritic and of terrestrial graphites indicate no difference in the relative abundance of the C isotopes. L. S. T.

Heavy minerals from Front Range granite. M. F. BOOS (J. Geol., 1935, 43, Part II, 1033—1048; Chem. Zentr., 1936, i, 2317).—The oldest pre-Cambrian granites contain radioactive minerals, and are characterised by the association of titanite (I), apatite (II), hornblende, and monazite. Granites of medium age contain (II), (I), zircon (III), and allanite (IV). The youngest granites contain coloured (III), (II), (IV), and tourmaline. J. S. A.

Origin of the S.E. Missouri lead deposits. I, II. W. A. TARR (Econ. Geol., 1936, 31, 712—754, 832—866).—Mode of occurrence, mineralogy, and paragenesis of the ores are discussed as well as the origin of the Pb deposits. The meteoric H_2O hypothesis is untenable and the ores are believed to be of magmatic origin. L. S. T.

Contact ore deposition at the Calumet iron mine, Colorado. C. H. BEHRE, jun., E. F. OSBORN, and E. H. RAINWATER (Econ. Geol., 1936, 31, 781—804).—Contact metamorphism and contact metamorphic ore deposition are discussed, together with the causes of localisation of ore in the Calumet mine. L. S. T.

Fusion relations of iron-orthoclase, with a discussion of the evidence for the existence of an iron-orthoclase molecule in feldspars. G. T. FAUST (Amer. Min., 1936, 21, 735—763).—The equilibrium relations along the section $K_2O + 6SiO_2$ (glass)— Fe_2O_3 of the system $K_2O-Fe_2O_3-SiO_2$ show that Fe orthoclase (I) ($KFeSi_3O_8$) and Fe leucite (II) ($KFeSi_2O_6$) exist, and can be prepared from dry melts. When heated, (I) dissociates into (II) + liquid, and (II) dissociates into hematite (III) + liquid. (III) is the stable phase at the liquidus 1265° . X-Ray powder-diffraction patterns indicate the similarity of the two K Fe silicates with the corresponding Al compounds. The relation between n and the Fe_2O_3 content in the $K_2O + 6SiO_2$ glasses is linear. L. S. T.

Earth's core. J. LYNCH (Science, 1937, 85, 15—16).—A solid metallic core heavily occluded with gas such as H_2 best fulfils the necessary requirements. L. S. T.

Contrasted differentiation. S. R. NOCKOLDS (Geol. Mag., 1936, 73, 529—535; cf. A., 1936, 1356). L. S. T.

Adamite from Chloride Cliff, California. J. MURDOCH (Amer. Min., 1936, 21, 811—812).—The adamite has d 4.3 approx., n 1.720, n_z 1.740, n_y 1.745+. L. S. T.

X-Ray study of pucherite. W. F. DE JONG and J. J. DE LANGE (Amer. Min., 1936, 21, 809).—Pucherite from Schneeberg, Saxony, has a 5.38, b 5.04, c 11.98 Å. (all ± 0.03 Å.). L. S. T.

New property of matter: reversible photosensitivity in hackmanite from Bancroft, Ontario. O. I. LEE (Amer. Min., 1936, 21, 764—776).—Hackmanite undergoes a colour intensification from colourless or pale pink to violet following a brief exposure to a suitable source of ultra-violet light. The exciting radiation is >4800 Å. and extends to 2250 Å. and perhaps lower. The induced colour fades slowly in the dark and rapidly and almost completely in strong light. Intensification and reversal can be repeated indefinitely, and may be due to the presence of a trace of Mn. L. S. T.

Oriented inclusions of tourmaline in muscovite. C. FRONDEL (Amer. Min., 1936, 21, 777—799). L. S. T.

Opals. J. W. HOWARD (J. Chem. Educ., 1936, 13, 553—556).—Modes of occurrence, sources and mining, composition and properties, and uses are described. L. S. T.

Identification of beryl and emerald by means of the "Universal" lens. O. HOLSTEIN (Zentr. Min., 1936, A, 26—28; Chem. Zentr., 1936, i, 2399).—A light filter for the Zeiss "Universal" lens is described, enabling green-coloured beryls (aquamarine) to be distinguished from emerald. J. S. A.

Composition of sanidine anorthoclase from Drachenfels, Siebengebirge. A. ENGELS (Zentr. Min., 1936, A, 9—13; Chem. Zentr., 1936, i, 2316).—Analyses are recorded. J. S. A.

Density and composition of plagioclases on ternary basis. K. CHUDOVA (Zentr. Min., 1936, A, 1—8; Chem. Zentr., 1936, i, 2317).—Satisfactory vals. may be calc. by the application of the extended Tschermak formula. J. S. A.

Optical and double refraction of α -zircon. K. CHUDOVA (Zentr. Min., 1935, A, 362—367; Chem. Zentr., 1936, i, 2317).—For an α -zircon from Ceylon (d 4.150), with Na light, $\omega = 1.8629$, $\epsilon = 1.8739$; for c -zircon (d 2.276), $\omega = 1.8784$, $\epsilon = 1.8949$. Simultaneous occurrence of α - and b -zircon in the same crystal is reported. J. S. A.

Crystallisation of rhombic and monoclinic pyroxenes from artificial silicate melts. D. P. GRIGORIEV (Zentr. Min., 1935, A, 353—357; Chem. Zentr., 1936, i, 2317).—In melts of MgO , $CaCO_3$, and SiO_2 , in the proportions $Mg_2SiO_4 : MgCaSi_2O_6 = 1:1$, +10% of CaF_2 , rhombic pyroxene-enstatite and monoclinic diopsidic pyroxene were detected. Conversion of enstatite (I) into diopside is promoted by CaF_2 . In the absence of a flux, (I) does not crystallise from $CaO + MgO + SiO_2$, since the inversion point klnoenstatite-(I) is $<$ the f.p. of the melt. J. S. A.

Chemical-mineralogical investigation of crystalline rocks from the Bondo region, near l'Uele, N. Belgian Congo. E. POLINARD (Publ. Congo belge Regions vois., 1934—1935, 122—131; Chem. Zentr., 1936, i, 2317).—Analyses are recorded. J. S. A.

Symmetry and crystal structure of the minerals of the arsenopyrite group. M. J. BUEGER (Z. Krist., 1937, 95, 83—113).—Several arsenopyrite specimens are examined in detail; the apparent

orthorhombic symmetry cannot satisfy the intensity data, and a superstructure based on the marcasite type is necessary. The usual crystals are really twinned, the components being of only monoclinic symmetry; this fact permits good agreement between calc. and measured intensities to be obtained. Crystal and cell characteristics are tabulated. The Fe must be present as Fe^{III} , ionic radius 1.13 Å., explaining the ability of arsenopyrite to take As^{III} instead into proxy-solution. B. W. R.

Composition of pollucite. H. STRUNZ (Z. Krist., 1936, 95, 1—8).—The formula, deduced by a combination of X-ray and chemical methods, is $(\text{Si}_4\text{Al}_2\text{O}_{12})\text{Cs}_2\text{H}_2\text{O}$; probable space-group $Ia3d$, and a_0 13.71 Å. The structure is probably a scaffolding of $(\text{Si},\text{Al})\text{O}_4$ tetrahedra with included Cs and H_2O . B. W. R.

Naturally occurring neutral and basic hydrates of magnesium carbonate. M. FENOGLIO (Atti R. Accad. Lincei, 1936, [vi], 24, 219—222).—The existence of the following compounds has been confirmed: nesquehonite, $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$, rhombic, symmetry D_{2h} , a 7.68, b 11.93, c 5.39 Å.; lansfordite, $\text{MgCO}_3 \cdot 5\text{H}_2\text{O}$, monoclinic, C_{2h} , a 12.48, b 7.55, c 7.34 Å.; artinite, $\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$, structure not certain; hydromagnesite, $4\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$, rhombic, D_{2h} , is more correctly represented as $5\text{MgO} \cdot 4\text{CO}_2 \cdot 5\text{H}_2\text{O}$. O. J. W.

Lead-uranium-thorium ratio of a single crystal of Wilberforce uraninite. C. M. ALTER and L. A. YUILL (J. Amer. Chem. Soc., 1937, 59, 390—391).—The composition of a single crystal of uraninite varies greatly in different parts. The ratio $\text{Pb} : \text{U} + \text{Th}$ is higher in the core than in the outer layers of the crystal. The bearing of the observations on the estimation of the age of minerals is discussed. E. S. H.

Magnetisation of ignited earths. Intensity of the terrestrial magnetic field in the past. E. THELLER (Compt. rend., 1937, 204, 184—186).—The magnetic properties of clays after ignition in a magnetic field, and the effects of subsequent re-ignition, were investigated. A method of estimating the intensity of the earth's magnetic field in past ages is proposed. A. J. E. W.

Spectrographic examination of colourless and blue halite. T. G. KENNARD, D. H. HOWELL, and M. P. YAECKEL (Amer. Min., 1937, 22, 65—67).—No difference in chemical composition of the colourless and blue varieties from the same specimen of halite from Stassfurt was observed. The blue colour is structural rather than pigmental. Sr, Ti, and Ba were present. L. S. T.

Crystallised powellite from Tonopah, Nevada. F. H. POUGH (Amer. Min., 1937, 22, 57—64).—A suite of powellite crystals, which are rare, is described. L. S. T.

Zonal gold mineralisation in Nova Scotia. W. H. NEWHOUSE (Econ. Geol., 1936, 31, 805—831).—Au deposits hypothermal, mesothermal, and one group near to epithermal in type occur in Nova Scotia in sedimentary and metamorphosed sedimentary rocks which have been intruded by large masses of granite, and locally by granite and pegmatite

dykes. The zonal mineralisation is described. The solutions which formed the Au veins probably came from granite at depth. The relations with the W minerals, which in small amounts are widely distributed in these veins, are discussed. L. S. T.

Bituminous schists of Quartellari, Rodi (Messina). G. LABRUTO and A. LANDI (Annali Chim. Appl., 1937, 27, 14—18).—The schists have d^{15} 2.218 and composition: H_2O 3.79, volatile matter 14.81, fixed C 10.18, and ash 71.22%. Total S = 3.88% of which 2.89% is pyritic and 0.42% is $\text{SO}_4\text{-S}$. Analysis of the org. matter gives C 76.96, H 9.75, N 0.41, S 0.57, and O 12.31%. Distillation yields 4% of ammoniacal H_2O and 11% of oil, d^{15} 0.928, calorific val. 10,000 g.-cal., b.p. 150—300° (40%), 300—340° (30%). L. A. O'N.

Puzzuolana. V. Microscopy of some Italian puzzuolanas. L. SANTARELLI (Annali Chim. Appl., 1937, 27, 3—14; cf. B., 1936, 885).—Puzzuolana from the lazial zone contains crystals of leucite, augite, and brown mica, and is leucitic in origin. Flegrea puzzuolana consists of trachitic material in various stages of transformation. Vulture puzzuolana contains augite, felspar, and hauyne and is derived from leuco-tephritic material in which the leucite is replaced by hauyne. Material of recent origin and weak puzzuolanic activity differs from that of ancient origin only in content of cryst. material. Technical evaluation by microscopy is suggested. L. A. O'N.

Geological occurrence of organic calcium compounds. W. FABER and K. KREJCI-GRAF (Tsch. Min. Petr. Mitt., 1937, 48, 305—316).—The occasional presence of small amounts of bitumen in the casts of fossil shells has suggested that org. Ca salts may be present in limestone. Extracts with EtOH and xylene gave only doubtful traces. They were, however, found in adipocere. L. J. S.

Basaltic rocks from the Tatika hills, Hungary. B. MAURITZ and H. F. HARWOOD (Mat. Term.-tud. Értesítő, 1936, 55, 75—103; Tsch. Min. Petr. Mitt., 1937, 48, 373—401).—Six new chemical analyses of basalts showing 23 constituents are given. L. J. S.

Water content of kaolinite, halloysite, and montmorillonite. M. MEHMEL (Chem. Erde, 1937, 11, 1—16).—Loss of H_2O was determined at different v.p. and at different temp., and n of the dehydrated material was determined. Halloysite ($\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 4\text{H}_2\text{O}$) loses $2\text{H}_2\text{O}$ at zero v.p. or at 50°, and then has the composition of kaolinite but a different crystal structure (A., 1935, 571). This metahalloysite then loses H_2O at 400—450° like kaolinite. Montmorillonite shows a steady loss up to about 200°, and the remainder of the H_2O is lost at 400—450°. L. J. S.

Vanadiferous muscovite from Schmiedefeld, Thuringia. H. JUNG (Chem. Erde, 1937, 11, 38—44).—A green fine-scaly mineral in quartz veins in the iron-ore deposits, previously thought to be pyrophyllite, is proved by chemical analysis and optical and X-ray data to be muscovite. It contains V_2O_5 1.08%. L. J. S.

Changes in the chemistry of eruptive rocks by weathering. G. GROSSER (Chem. Erde, 1937, 11, 73—216; cf. A., 1932, 596).—Results of many analyses of fresh and weathered granitic rocks are plotted on diagrams. L. J. S.

Montmorillonite from Dolmar, Meiningen. H. JUNG (Chem. Erde, 1937, 11, 217—222).—Pockets and crevices in basalt contain a white to brown clay with pink streaks. Analysis of the pink material proves it to be montmorillonite. L. J. S.

Ben Bullen plutonic complex, N.S.W. G. A. JOPLIN (J. Proc. Roy. Soc. New South Wales, 1936, 70, 69—94).—The complex has an earlier basic nucleus surrounded by a later more acid intrusion. Chemical peculiarities (high Al_2O_3 , with FeO consistently $>$ MgO) and the type of hybridisation indicate that it is probably co-magmatic with the Hartley complex. Analyses are recorded. A. LI.

Structure of catapleiite. B. BRUNOVSKI (Acta Physicochim. U.R.S.S., 1936, 5, 863—892).—A structure based on the space-groups C_{2v}^4 , D_{2h}^4 , and is suggested. The following at. distances were calc. O_{II} — O_{II} , 2.55; O_I — O_I , 3.03; Si — O_{II} , 1.52; Si — O_I , 1.70; Na — O_{II} , 2.58; Na — O_I , 2.51 Å. C. R. H.

Geology of southern Saskatchewan. F. J. FRASER, F. H. MCLEARN, L. S. RUSSELL, P. S. WARREN, and R. T. D. WICKENDEN (Can. Dept. Mines, 1935, Geol. Survey Mem. No. 176, 137 pp.).

CH. ABS. (e)

Scotland: the Tertiary volcanic districts. J. E. RICHEY. The south of Scotland [geology]. J. PRINGLE. Welsh Borderland. R. W. POCOCK and T. H. WHITEHEAD. Northern Wales. B. SMITH and T. NEVILL. Northern England. T. EASTWOOD. Grampian highlands. H. H. READ (Geol. Survey Gt. Brit., 1935, 115, 97, 84, 92, 76, 81 pp.).

CH. ABS. (e)

Geology of Ceylon. J. S. COATES (Ceylon J. Sci., 1935, B, 19, 101—187).—A discussion and summary of data. CH. ABS. (e)

Porosity of Ceylon rocks. J. S. COATES (Ceylon J. Sci., 1935, B, 19, 189—191).—The porosity was in the approx. ascending order: garnetiferous khondalite, dolerite, charnockite, khondalite, biotite-gneiss, pink granitoid gneiss, leptynite, and pink granulite. Vals. for charnockite corresponded with those for Aberdeen and Stonehaven granite. CH. ABS. (e)

Magmatic associations. III. Role of titanium and zirconium in rock-forming silicates. W. KUNITZ (Neues Jahrb. Min., 1936, A, 70, 385—466; Chem. Zentr., 1936, i, 2724—2725).—A discussion of isomorphism observed in various minerals containing Ti and Zr. H. J. E.

Composition of Vasko-Dognácska granites. L. VON ZOMBORY (Math. nat. Anz. ung. Akad. Wiss., 1935, 52, 179—187; Chem. Zentr., 1936, i, 2523).

H. J. E.

Kaolinitic weathering of feldspar rocks. A. VASEL (Zentr. Min., 1936, A, 13—15; Chem. Zentr., 1936, i, 2523).

H. J. E.

Accelerated weathering of feldspars. F. H. NORTON (Amer. Min., 1937, 22, 1—14).—The action of $\text{H}_2\text{O} + \text{CO}_2$ on orthoclase (I), anorthite (II), and albite at const. temp. under conditions in which fresh solute is continuously supplied and sol. reaction products are continuously removed has been investigated. At temp. $> 320^\circ$, (I) is converted into sericite, and up to 300° (II) is converted into pyrophyllite. (III) is partly decomposed into products not yet identified. L. S. T.

Petrology of the Salsette Island, Bombay. A. S. KALAPESI and G. P. CONTRACTOR (J. Univ. Bombay, 1936, 5, Part II, 151—171).—Chemical compositions of the rocks have been determined. E. S. H.

Petrology of the syenite stock of Cherry Mountain, New Hampshire. R. W. CHAPMAN (Amer. J. Sci., 1937, [v], 33, 174—186).—The mountain consists of an elliptical mass of syenite of the White Mountain magma series (A., 1935, 1345) about 35 miles square intruding into older granites, and probably formed by cauldron subsidence. The petrological composition of the syenites and granite is given. R. C. M.

Silicates. IV. Behaviour of pyrophyllite, $\text{Al}_2(\text{Si}_4\text{O}_{10})(\text{OH})_2$, on heating and the existence of an anhydrous pyrophyllite, $\text{Al}_2(\text{Si}_4\text{O}_{10})\text{O}$. E. THILO and H. SCHUNEMANN (Z. anorg. Chem., 1937, 230, 321—335; cf. A., 1936, 39).—Pyrophyllite (I) loses H_2O of constitution at 400° , the rate depending on the degree of subdivision; H_2O is not absorbed at low partial pressures of H_2O . The solubility of (I) in aq. NaOH or HCl is unchanged by previously heating at 400° ; when dehydrated at 400 — 1100° the solubility increases slightly, and at higher temp. very greatly; this change corresponds with a lattice transformation. X-Ray evidence shows that dehydration causes no essential change in lattice structure up to 1150° , but at higher temp. a transformation occurs and the components mullite and cristobalite are recognised. E. S. H.

Origin of Don basin Tertiary siliceous sandstones. D. BOBROVNIK (Ukrain. Chem. J., 1936, 11, 469—482).—The sandstones originated from agglutination of SiO_2 particles, formed as the final product of acid weathering of clays in lakes. R. T.

Gallium in specimens collected by expeditions of the Lomonosov Institute of the Academy of Science of the U.R.S.S. S. A. BOROVNIK and A. F. SOSEDKO (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 31—34).—0.0001—0.1% of Ga was found spectroscopically in samples of muscovite collected in Asia. Other minerals contained $< 0.01\%$ of Ga. J. G. A. G.

Mineralogy of Mecklenburg soils. W. VON ENGELHARDT (Chem. Erde, 1937, 11, 17—37).—Soils taken at three depths were separated according to grain size and the amounts of the different minerals determined in each, the extent of alteration of the feldspars being also noted. Plant-available K is related to the amount of K minerals in grains < 3 — 16 Nontronite is the essential material for base exchange. L. J. S.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

MAY, 1937.

Calculation of terms for the ionised hydrogen molecule. E. HELLMIG (Z. Physik, 1937, 104, 694—710).—The Wentzel-Brillouin-Kramers method of phase-integrals is applied to the calculation of the Rydberg corrections for the more highly excited states of H_2^+ .
H. C. G.

Structure of H_α and D_α . W. V. HOUSTON (Physical Rev., 1937, [ii], 51, 446—449).—A Fourier series method of analysis of the interferometer pattern due to a group of spectral lines is described and illustrated by application to two plates of H_α and D_α .
N. M. B.

Interferometer wave-lengths of certain lines in the secondary spectrum of D_2 and HD. N. A. KENT and R. G. LACOUNT (Physical Rev., 1937, [ii], 51, 241—242).—Intensities and $\lambda\lambda \pm 0.0003$ Å. are tabulated for 24 lines of D_2 and 14 lines of HD in the range 4860—5800 Å.
N. M. B.

Presence of molecular hydrogen in sun-spots. II. G. PICCARDI (Atti R. Accad. Lincei, 1936, [vi], 24, 286—288; cf. this vol., 158).—The literature of the subject is reviewed.
O. J. W.

Double excitation losses in helium. W. SWIFT and R. WHIDDINGTON (Proc. Leeds Phil. Soc., 1937, 3, 262—264; cf. A., 1935, 799).—Accurate re-measurement gives for the energy loss of the more intense $(1s)^2$ — $(2s2p)$ line and the weaker unassigned line the vals. 59.73 ± 0.01 and 63.25 ± 0.02 volts, respectively.
N. M. B.

Angular distribution in the helium double excitation. S. B. COLES and R. WHIDDINGTON (Proc. Leeds Phil. Soc., 1937, 3, 257—261; cf. Priestley, A., 1935, 799).—The variation of probability of excitation of double excitation with energy change of impacting electrons is determined and compared with that of the $2 \times (2P)$ collision process. The max. probability is in the region 700—800 volts. Angular distribution curves for $(2s2p)^1P$ and 3^1P excitation are discussed; they show qual. agreement with theory at 400 volts.
N. M. B.

Spectroscopic study of the magnetron discharge. O. LUHR and F. J. STUDEB (Physical Rev., 1937, [ii], 51, 306—310; cf. A., 1936, 397).—In order to investigate the efficiency of the magnetron discharge in producing higher ionisation states, a study of the spectra of He, H, N, and Hg for the range 7000—2000 Å., using a discharge between a W filament and a Ni cylinder over a wide range of voltage, current, and gas pressure, is reported. Higher members of the series in the He I and He II spectrum were intensified, and lines of the N II, N III, N IV, and Hg II spectra were identified.
N. M. B.

Excitation of light by impact between lithium ions and helium atoms: conservation of spin. W. MAURER (Z. Physik, 1937, 104, 658—665).—Impact of Li ions on He atoms gives He I lines, He II (λ 4686 Å.), and Li II (λ 5485 Å.) in addition to strong Li I lines. The Li I lines are due to the discharge of Li^+ in the gas with simultaneous emission from the Li atoms.
L. G. G.

Zeeman effect of N II. J. B. GREEN and H. N. MAXWELL (Physical Rev., 1937, [ii], 51, 243—245).—Using He as residual gas with a small N_2 impurity, the Zeeman effect was studied at field strengths of about 36,000 gauss. Data for $\lambda\lambda$, classifications, Zeeman patterns, and g vals. are tabulated for 47 lines. A few exceptions in which g vals. are not LS are considered.
N. M. B.

Influence of pressure on the excitation function of bands of the ionised nitrogen molecule. R. BERNARD (Compt. rend., 1937, 204, 488—490).—The effect of the exciting potential E and the pressure p on the production of N_2^+ bands has been investigated. The true max. of the excitation function, at E — 48 volts, was observed using low p vals.; when p is such that the mean free path of the electrons is of the order of the electrode dimensions, the apparent max. occurs at E — approx. 130 volts, owing to multiple collisions.
A. J. E. W.

Nitrogen in the spectra of comets. J. DUFAY (Compt. rend., 1937, 204, 744—746).— N_2^+ bands, and bands in the second positive and Vegard-Kaplan systems of N_2 , have been observed. The mechanism of their emission is discussed.
A. J. E. W.

Fine structure in the 3Σ ground state of the oxygen molecule, and the rotational intensity distribution in the atmospheric oxygen band. R. SCHLAPP (Physical Rev., 1937, [ii], 51, 342—345).—The formula developed by Kramers and by Hebb (cf. A., 1936, 655) is compared with experimental data, and parameter vals. are corr. The corr. formula is co-ordinated with observed fine structure and intensity measurements.
N. M. B.

Absorption of liquid oxygen. P. TULIPANO (Nuovo Cim., 1935, [ii], 12, 418—422; Chem. Zentr., 1936, i, 2689).—Absorption bands were observed at $\lambda\lambda$ 6300, 5780, 5314, 4800, 4458, 3793, and 3611 Å. The corresponding vals. of the absorption coeff. were 0.226, 0.274, 0.074, 0.084, 0.028, 0.054, and 0.214.
H. J. E.

Absorption of liquid oxygen. A. CARRELLI (Nuovo Cim., 1935, [ii], 12, 423—425; Chem. Zentr., 1936, i, 2689—2690; cf. preceding abstract).—Ab-

sorption data indicate the formation of the mol. O_2-O_2 by polarisation forces. H. J. E.

Effect of excited gas on the processes in the cathode region of the glow discharge. E. REICHRUDEL and G. SPIVAK (Physikal. Z. Sovietunion, 1936, 10, 121—141).—The effect of excited atoms on the cathode drop in $Ne + A$, and the distribution of such atoms in the cathode region, have been investigated. A. J. M.

Relative f -values for lines of Fe I. D. H. MENZEL and L. GOLDBERG (Astrophys. J., 1937, 85, 40—41).—Recently-published vals. (*ibid.*, 1935, 82, 377) must be corr. for a wt. factor. L. S. T.

Term scheme of the diatomic selenium molecule. H. CORDES (Naturwiss., 1937, 25, 219—220).—The term scheme of Se_2 , analogous to that of S_2 , is given. The dissociation energy of Se_2 is 3.0 ± 0.1 volts (69.2 ± 2.3 kg.-cal. per g.-mol.). Te_2 has a similar term scheme and term combinations to Se_2 and has a dissociation energy of approx. 2.4 volts (55 kg.-cal. per g.-mol.). A. J. M.

$3P^0-3P$ -term combination in the arc spectrum of cerium. S. FRISCH (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 287—288).—A configuration of the normal state of Ce in accordance with the conclusions of Albertson (A., 1935, 556) is deduced from the structure of a group of five lines observed by Paul (A., 1936, 262) in the absorption spectrum of Ce. O. D. S.

Modification of spectral lines by very close collisions. W. M. PRESTON (Physical Rev., 1937, [ii], 51, 298—306).—A study of the spectra of Hg, Cd, and Tl, when a few cm. pressure of a rare gas is added to a discharge through the vapour of the metal, indicates that bands of the type reported by Oldenberg (cf. A., 1929, 860) on the short- λ side of the resonance line Hg 2536.7 occur with all metal lines, and with a total relative intensity of the same order of magnitude. N. M. B.

Normal cathode [voltage] drop at single-crystal surfaces with different orientations. I. H. KURZKE (Z. Physik, 1937, 104, 735—743).—Surfaces of single crystals were used as cathode in discharge tubes containing A. The cathode voltage drop varies with the orientation at the crystal surface. For a single Bi crystal the difference between the (111) and the (111) planes was 3—4 volts. H. C. G.

Theory of widening of spectral lines of a series by a foreign gas. C. REINSBERG (Naturwiss., 1937, 25, 172).—The widening of the principal series lines in the spectra of the alkali metals by addition of foreign gases (He etc.) observed by Fichtbauer *et al.* (A., 1935, 136) is explained on the basis of quantum mechanics. A. J. M.

Passage of the Zeeman effect into the Paschen-Back effect of hyperfine structure in the polarisation of resonance radiations. P. SOLEILLET (Compt. rend., 1937, 204, 570—571).—Theoretical. A. J. E. W.

Production of auroral and night-sky light. S. CHAPMAN (Phil. Mag., 1937, [vii], 23, 657—665).—An alternative theory is developed and discussed in relation to available data and theory. N. M. B.

Fluorescence phenomena and central intensity in Fraunhofer lines. A. PANNEKOEK (Month. Not. Roy. Astron. Soc., 1935, 95, 725—732; Chem. Zentr., 1936, i, 2691). H. J. E.

Asymmetric Zeeman effect patterns in a complex spectrum. J. E. MACK and O. LAPORTE (Physical Rev., 1937, [ii], 51, 291—292).—Theoretical. N. M. B.

Analysis of Röntgen-ray absorption into photo-absorption and Compton scattering. H. KÜSTNER and H. TRÜBESTEIN (Ann. Physik, 1937, [v], 28, 385—408).—An equation enabling X-ray absorption by substances from light elements to be analysed quantitatively into photo-absorption and Compton scattering and absorption is derived. The whole absorption curve can be calc. from single measurements in each of the long-, medium-, and short-wave regions. Using the filter difference method, and monochromatic radiation 20 times as strong as before, results agreeing with calculations to $\pm 3\%$ were obtained. Mass absorption coeffs. for H_2O , triolein, blood, and muscle were measured from 0.1 A. to 1.7 A. and the coeffs. for C, N, H, and O calc. The relation $F(\lambda)$ between air ionisation and incident Röntgen energy is calc. and agrees with data available down to 0.35 A. to $\pm 5\%$. At shorter $\lambda\lambda$ calculations indicate a min. for $F(\lambda)$ at 0.12 A. and a max. at 0.05 A. H. C. G.

K -Slope of [elements] $_{13}Al$ to $_{74}W$. H. RIND-FLEISCH (Ann. Physik., 1937, [v], 28, 409—437).—The ratio of the mass absorption coeff. on the short-wave side (μ_k/ρ) to that on the long-wave side (μ_l/ρ) of the K -edge was measured for 8 elements by the filter difference method of Küstner. The characteristic secondary radiation of the absorbing material has a negligible effect on results, but holes in the filters used may have serious effects. The quantities μ_k/ρ , μ_l/ρ , their difference, and their quotient may be expressed as functions of λ or at. no. of the form $k.\lambda^s$ or $K.Z^t$ where k , K , s , and t are consts. and Z is at. no. H. C. G.

Theory of photo-electric absorption for X-rays and γ -rays. H. HALL (Rev. Mod. Physics, 1936, 8, 358—397).—Mathematical. Non-relativistic theory leads to vals. of the mass absorption coeffs. for the K and L electronic shells of the elements consistent with experimental data. Relativistic effects are considered and the photo-electric disintegration of the deuteron is discussed. J. G. A. G.

Problems of atmospheric physics. E. V. APPLETON (J. Soc. Arts, 1937, 85, 299—307, 321—330, 338—346).—Lectures.

Thermionic emission into dielectric liquids. E. B. BAKER and H. A. BOLTZ (Physical Rev., 1937, [ii], 51, 275—282).—Thermionic emission at room temp. for cathodes in contact with PhMe distilled with Na in a N_2 atm. in a special combined electrode chamber and still is investigated. The current-voltage relation obeys a modified Schottky vac. law of the form $I = I_0 e^{[(eFD)^{1/2}/kT]}$, where I is the current, F the field, and D the dielectric const. of the liquid. The effects of adsorbed H_2 and O_2 , surface irregularities, and work function are discussed. The formation of an insol. wax, similar to that found in oil- or paper-

insulated cables, due to electron bombardment is reported. N. M. B.

Emission from thoriated tungsten and thoriated molybdenum. I. Thoriated tungsten. E. BRÜCHE and H. MAHL (Z. tech. Physik, 1935, 16, 623—627; Chem. Zentr., 1936, i, 2704).—Th diffuses through the W lattice only at discrete points, which are not necessarily at the grain boundaries.

H. J. E.

Photo-electric work functions of the 211 and 310 planes of tungsten. C. E. MENDENHALL and C. F. DE VOE (Physical Rev., 1937, [ii], 51, 346—349).—The W crystal was outgassed for about 4 months and flashed at 2200° for 7 sec. once per min. for 1500 hr. The work functions of the 211 and 310 planes, determined by Fowler's method, were 4.50 and 4.35 volts, respectively. N. M. B.

Study of the surplus heating of a cathode in a magnetron. I. M. VIGDORTSCHIK (Physikal. Z. Sovietunion, 1936, 10, 634—648).—In a one-plate magnetron increases of plate current and filament temp. occur for certain vals. of magnetic field. The first "flash" is supposed due to ionic bombardment of the cathode, and the second to the ionisation of W vapour at high temp. A. E. M.

Classical dynamics of the electron. Theory of first functions and the characteristic moment of the electron. B. KWAL (Compt. rend., 1937, 204, 560—562).—Mathematical. A. J. E. W.

Space-charge equation for electrons with initial velocity. II. W. KLEEN and H. ROTHE (Z. Physik, 1937, 104, 711—723; cf. A., 1936, 1439).—Mathematical. H. C. G.

Equations of motion of electrons in gases. J. S. TOWNSEND (Phil. Mag., 1937, [vii], 23, 481—486; cf. A., 1936, 1052).—The distribution of the energies of the electrons is considered. J. G. A. G.

Motions of electrons in magnetic fields and alternating electric fields. L. G. H. HUXLEY (Phil. Mag., 1937, [vii], 23, 442—464).—Mathematical. J. G. A. G.

Motions of electrons in a gas in the presence of variable electric fields and a constant magnetic field. V. A. BAILEY (Phil. Mag., 1937, [vii], 23, 774—791).—Mathematical. N. M. B.

Dependence of secondary electron emission of various metals on the angle of incidence of the primary cathode rays. H. O. MÜLLER (Z. Physik, 1937, 104, 475—486).—Secondary electron emission from Ni, Al, Mo, W, Cu, and C, supported on a rotatable plate in a cathode-ray tube, is measured by means of an auxiliary anode. The no. of secondary electrons, s , is given approx. by $s = B/\cos \alpha$, where B is a const. and α the angle of incidence. L. G. G.

Shot effects of secondary electron currents. L. J. HAYNER (Physics, 1935, 6, 323—333).—Secondary emission and primary impact are simultaneous within 10^{-6} sec. CH. ABS. (c)

Scattering of cathode rays of medium velocity in gases. A. BECKER and E. KIPPAN (Ann. Physik, 1937, [v], 28, 465—506).—The distribution

of intensity of cathode rays in 16 gases at different pressures (0—1 atm.), using an incident parallel beam (20—80 kv.), was determined, and equations governing the scattering were derived. A. J. M.

Double scattering of rapid electrons. H. RICHTER (Ann. Physik, 1937, [v], 28, 533—554).—Investigations of the polarisation of electron waves have been made by observation of the double 90° scattering of electron beams at two metal foils used as mirrors. With Au there was some single nuclear scattering, agreeing with Rutherford's scattering law. No polarisation for scattering at Al, or at thin Au foils, was detected when the potential was 20—120 kv. The results do not agree with Mott's theory, which requires a marked polarisation effect for double 90° scattering at Au at the higher potentials, and no effect for Al. A. J. M.

Primary ionisation in helium and hydrogen. E. J. WILLIAMS (Proc. Camb. Phil. Soc., 1937, 33, 179—182).—Theoretical. The departure of He from being H-like is sufficient to explain the equality of the primary ionisations of He and H₂ by cosmic-ray electrons described by Cosyns (A., 1936, 1315). The ionisation of H₂ by electrons is approx. in agreement with theory at electron energies of 8×10^4 and 5×10^8 e.v., but differs at energy of 65×10^4 e.v. O. D. S.

Ionisation and dissociation of polyatomic molecules by electron impact. I. Methane. L. G. SMITH (Physical Rev., 1937, [ii], 51, 263—275).—From a mass-spectrographic study of products of ionisation by low-speed electrons, the following positive ions in CH₄ and their appearance potentials in volts are reported: CH₄⁺ 13.1 ± 0.4 ; CH₃⁺ 14.4 ± 0.4 ; CH₂⁺ 15.7 ± 0.5 , 22.9 ± 0.8 ; CH⁺ 23.3 ± 0.6 ; C⁺ 26.7 ± 0.7 ; H⁺ 22.7 ± 0.5 , 29.4 ± 0.6 ; H₂⁺ 27.9 ± 0.5 , and H₃⁺ 25.3 ± 1.0 . Negative ions observed were CH₂⁻, CH⁻, C⁻, and H⁻. Three independent calc. vals. for the heat of dissociation of CH₄, leading to upper limits for the heat of sublimation of C 141 ± 14 , 131 ± 16 , and 139 ± 21 kg.-cal., are consistent with available data (cf. Lozier, A., 1934, 1159; Goldfinger, A., 1936, 1454). Calc. ionisation potential upper limits are: CH₃ 9.9, CH₂ 12.0, and CH 11.7 or 16.2 volts. Appearance potentials are interpreted. N. M. B.

Ionisation by ionic impact. II. A. ROSTAGNI (Ric. sci. Prog. tecn., 1935, [ii], 6, 268—269; Chem. Zentr., 1934, i, 2905; cf. A., 1936, 539, 1312).—Effect collision radii for the ionisation of He and Ne by He⁺ and Ne⁺ are recorded up to velocities of 1000 volts. J. S. A.

Discharge of alkali ions through various gases. F. WOLF (Ann. Physik, 1937, [v], 28, 438—444).—A continuation of work already noted (this vol., 3). L. G. G.

Ionic mobility of gaseous ions in carbon dioxide at high pressures. C. B. MADSEN (Kong. dansk. Viden. Selsk., mat.-fys. Medd., 1936, 13, No. 14, 15 pp.; Chem. Zentr., 1936, i, 2701—2702).—At 15—50 atm. two groups of positive and one group of negative ions were observed. H. J. E.

Recent advances in the methods of investigation of atomic and ionic rays. R. RITSCHL (Physikal. Z., 1937, 38, 141—157).—A review.

A. J. M.

Accommodation coefficient of positive ions on the surface of a probe electrode. N. MOR-GULIS (Physikal. Z. Sovietunion, 1936, 10, 565—566).—Molthan's experiments are criticised (cf. A., 1936, 263).

H. J. E.

Sign of the magnetic moment of the ^{39}K nucleus. H. C. TORREY (Physical Rev., 1937, [ii], 51, 501—508).—A method based on non-adiabatic transitions in an at. beam (cf. Rabi, A., 1936, 404) is developed. A beam of normal alkali atoms is split in a weak inhomogeneous magnetic field, transitions are then induced among the component magnetic levels, and strong field analysis of a selected state identifies the quantum nos. and gives the sign of the moment. The nuclear magnetic moment of ^{39}K is positive, contrary to the result of Jackson (A., 1936, 397), and that of ^{23}Na is positive.

N. M. B.

At. wt. of carbon. II. G. P. BAXTER and A. H. HALE (J. Amer. Chem. Soc., 1937, 59, 506—509; cf. A., 1936, 540).—The val. 12.010 is obtained from combustion determinations with chrysene, $\text{C}_{22}\text{H}_{14}$, and anthracene.

E. S. H.

Isotopic constitution of neodymium. A. J. DEMPSTER (Physical Rev., 1937, [ii], 51, 289).—Analysis of ions from a spark between Nd electrodes shows that the masses 148 and 150 previously reported (cf. Proc. Amer. Phil. Soc., 1935, 75, 735) belong to Nd, as suggested by Aston (cf. A., 1936, 657).

N. M. B.

Production of weighable quantities of the strontium isotope 87 as transformation product of rubidium from a Canadian mica. O. HAHN, F. STRASSMANN, and E. WALLING (Naturwiss., 1937, 25, 189).—A mica from Manitoba, rich in Rb but poor in alkaline earths, yielded SrCO_3 containing 99% of ^{87}Sr . This has been formed, in agreement with Mattauch's rule, by the radioactive disintegration of ^{87}Rb . From the Rb content of the mica, and an estimate of its geological age, the provisional val. for the half-life of the mixed element is 2×10^{11} years.

A. J. M.

The ^{87}Rb - ^{87}Sr pair and the isobar rule. J. MATTAUCH (Naturwiss., 1937, 25, 189—191).—The isotopic constitution of the Sr obtained by Hahn *et al.* (cf. preceding abstract) was determined by the double-focussing mass spectrograph. The Sr consists of 99.97% of ^{87}Sr with at. wt. 86.94. The formation of ^{87}Sr by the β -disintegration of ^{87}Rb is in accordance with the rule that stable isobars of neighbouring elements cannot exist.

A. J. M.

Stable isobars. D. R. INGLIS and L. A. YOUNG (Physical Rev., 1937, [ii], 51, 525—526).—Mathematical. Deductions due to Wigner (cf. this vol., 110) are simplified and extended.

N. M. B.

Packing fractions of ^{86}Sr and ^{87}Sr by the doublet method. J. MATTAUCH (Naturwiss., 1937, 25, 170—171).—The packing fractions of ^{86}Sr and ^{87}Sr were found by comparison with the SiF_3 line at 87. The difference in packing fraction is 9.0 for

($^{29}\text{SiF}_3$ - ^{86}Sr) and 8.5 for ($^{30}\text{SiF}_3$ - ^{87}Sr). Using the data of Pollard *et al.* (A., 1936, 920) for the mass of ^{30}Si , the packing fraction of ^{87}Sr is -8.7 ± 0.3 and its mass is $86.924_3 \pm 0.004$. From the data of Aston for ^{29}Si and ^{19}F , the packing fraction of ^{86}Sr is -9.0 ± 0.5 and its mass is $85.922_6 \pm 0.004$.

A. J. M.

Ionisation of gases by high-energy β -particles. F. T. ROGERS, jun. (Physical Rev., 1937, [ii], 51, 528).—A more precise equation for the no. of ions of a gas formed by β -particles in a cm. length of its path is given and illustrated for H., N., O., and Ne.

N. M. B.

Relations in β -ray transformations and the neutrino theory. H. O. W. RICHARDSON (Nature, 1937, 139, 505—506).—The application of the Fermi and the Konopinski-Uhlenbeck formulæ is discussed. A combination of the two is necessary to give the shape of β -ray spectrum for Ra-E or for radio-P, ^{32}P .

L. S. T.

Structure of a β -ray line by semicircular focussing. K. T. LI (Proc. Camb. Phil. Soc., 1937, 33, 164—178).—Theoretical. The distribution of a homogeneous group of electrons by semicircular magnetic focussing is calc. for plane and cylindrical sources. The dependence of max. intensity on the radius of curvature of the path of the electrons is investigated. Results are confirmed by experiment.

O. D. S.

β -Radioactivity and nuclear forces. I. TAMM (Physikal. Z. Sovietunion, 1936, 10, 567—604).—A generalised form of Fermi's theory of β -decay is developed and applied to the interaction of protons and neutrons. Results are in agreement with the shapes of β -spectra and account for the correlation between the lifetime of β -radioactive isotopes and the max. energy of electrons and positrons emitted by them. Forces between neutrons and protons in the nucleus can be explained only by the introduction of two arbitrary consts. into the equations and a quant. correlation between nuclear forces and β -decay appears at present impossible.

H. C. G.

Coincidence measurements on β - and γ -rays from Ra-C. W. BOTHE and H. MAIER-LEIBNITZ (Z. Physik, 1937, 104, 604—612).—Coupling occurs between nuclear β -radiation and γ -radiation from Ra-C. Conclusions are reached as to the term scheme of the transformed Ra-C nucleus.

L. G. G.

Value of absorption coefficient of hard γ -rays of radium in beryllium. J. STARKIEWICZ (Acta phys. polon., 1935, 4, 79—84; Chem. Zentr., 1936, i, 2893—2894).—The absorption coeff., and the effective diameter of the electron and of the Be nucleus for the γ -radiation of Ra-B + C are evaluated. The val. found corresponds with $\lambda = 6.4 \text{ X}$.

J. S. A.

β - and γ -Radiation of Ra-C". S. DEVONS and G. J. NEARY (Proc. Camb. Phil. Soc., 1937, 33, 154—163).—Measurements were made of the absorption of β - and γ -rays from Ra-C". The range in Al of β -rays corresponds with an energy limit of $(1.95 \pm 0.15) \times 10^6 \text{ e.v.}$ The absorption coeff. of γ -rays in Cu corresponds with a fairly homogeneous radiation of energy $(5 \pm 1) \times 10^6 \text{ e.v.}$ The total energy of the

disintegration is equal, within the limits of error, to that estimated by Rutherford *et. al.* (A., 1933, 443).

O. D. S.

Ionisation of air by γ -rays as a function of pressure and collecting field. II. I. S. BOWEN and E. F. COX (Physical Rev., 1937, [ii], 51, 232—234; cf. A., 1932, 895).—Measurements reported by Clay (Physica, 1935, 2, 825) of γ -ray ionisation currents in air at high pressures are largely modified by vol. recombination at collecting fields < about 400 volts per cm. The Jaffe theory of columnar ionisation does not fully explain observed data.

N. M. B.

Ionisation of gamma rays in air at high pressure at various temperatures. J. CLAY, H. J. STAMMER, and M. VAN TIJN (Physica, 1937, 4, 216—220).—Data for γ -ray ionisation currents in air at 1—152 atm./20—50° are recorded. The saturation current is independent of temp.

H. J. E.

Refraction of neutrons. G. N. LEWIS and P. W. SCHUTZ (Physical Rev., 1937, [ii], 51, 369).—A marked decrease in activity of a Ag target bombarded by neutrons passing through a paraffin collimator tube when the inner edge of the tube is bevelled indicates that the lower inner edge of the tube acts as a prism and suggests the use of a paraffin lens for focussing neutron beams.

N. M. B.

Interaction of fast neutrons with lead. G. E. GIBSON, G. T. SEABORG, and D. C. GRAHAME (Physical Rev., 1937, [ii], 51, 370).—Experiments on a direct interaction of fast neutrons with extra-nuclear electrons reported by Kikuchi (cf. this vol., 4) indicate an explanation on the supposition that the fast neutrons excite γ -rays in the Pb shielding the counter.

N. M. B.

Neutron optics. G. N. LEWIS (Physical Rev., 1937, [ii], 51, 371; cf. this vol., 6).—The problem of obtaining optical effects in a neutron beam is discussed. The importance of coherence, measured by the max. difference in path between two parts of a divided beam still permitting interference, is examined.

N. M. B.

Magnetic moment of the neutron. P. N. POWERS, H. G. BEYER, and J. R. DUNNING (Physical Rev., 1937, [ii], 51, 371—372; cf. this vol., 107).—Further experiments, in which neutrons were directed normally through magnetised Fe plates, in order to observe directly the effect of the magnetic moment of the neutron and magnetic scattering, are described. The existence of magnetic interaction with magnetised materials arising from neutron magnetic moment is indicated.

N. M. B.

Neutron emission of beryllium on bombardment with H, D, and He. R. DOPEL (Z. Physik, 1937, 104, 666—671).—Neutron emission and the mechanism of disruption of Be by bombardment with positive rays of H, D, and He with energies up to 200 kv. were investigated. The interaction ${}^9\text{Be} + {}^1\text{H}$ gives no neutrons; nothing definite could be obtained from ${}^9\text{Be} + {}^2\text{D}$ owing to the possibility of the interaction ${}^9\text{Be} + {}^2\text{D} \rightarrow {}^4\text{He} + {}^6\text{Li}$. Neutron emission from the process ${}^9\text{Be} + {}^4\text{He} \rightarrow {}^{12}\text{C} + {}^1\text{n}$ was just detectable at 200 kv.

H. C. G.

Resonance of tungsten nuclei for the capture of single neutrons and the form of active resonance levels. R. JAECKEL (Z. Physik, 1937, 104, 762—778).—W has a resonance level at which non-thermal neutrons having an energy of 9 ± 4 volts are selectively absorbed. The max. absorption coeff., K_0 , was found to be 35 cm.² per g. and that for thermal neutrons 0.1 cm.² per g.

H. C. G.

γ -Rays excited by capture of neutrons. J. H. E. GRIFFITHS and L. SZILARD (Nature, 1937, 139, 323—324).—A method for observing the capture radiation emitted by slow neutron absorbers is described. Using that of Cd as an indicator of neutron intensity, the absorption cross-section of slow neutrons has been determined for Cl, Co, Rh, Ag, Cd, Ir, Au, and Hg. The γ -ray effect per captured neutron has been compared for these elements and for Sm, Gd, and In, and although the at. wts. vary from 35 to 200, the effects are approx. equal. 7 quanta are probably emitted from Cd per captured neutron. The intense neutron absorption of Cl is probably due to radiative capture which leads to a Cl isotope of long half-life period which has not yet been detected. The view that Y has a large capture cross-section for slow neutrons and must therefore transform into an undetected radioactive isotope is not supported. Ba also shows a capture cross-section that previously reported. B shows a γ -ray effect approx. 0.05 that of Cd.

L. S. T.

γ -Ray excitation by fast neutrons. H. AOKI (Nature, 1937, 139, 372—373).—Relative cross-sections of 41 elements for γ -ray excitation by 2.4 m.e.v. neutrons are plotted against at. no.

L. S. T.

Interaction of neutron with deuteron. S. KIKUCHI, H. AOKI, and E. TAKEDA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 195—204; cf. A., 1936, 541).—No excitation of γ -rays was detected on bombarding D_2O with slow or fast neutrons. Contrary to the results of Dunning (A., 1935, 1186), the efficiency of D_2O in slowing down neutrons was < 1/27 of that of H_2O .

H. J. E.

Scattering of photo-neutrons by protons. A. LEIPUNSKI, L. ROSENKEVITSCH, and D. TIMOSHUK (Physikal. Z. Sovietunion, 1936, 10, 625—633).—The mean free path in paraffin of neutrons obtained by the action of γ -rays from Ra and its products on Be is 1.5 ± 0.4 cm., and on D is slightly > 1 cm. Results agree with the Fermi-Wigner theory if the mean free path of neutrons having thermal velocities in paraffin depends mainly on scattering by bound protons.

H. C. G.

Resonance levels of neutrons in silver nuclei. C. Y. CHAO and C. Y. FU (Nature, 1937, 139, 325).

L. S. T.

Diffusion of slow neutrons in hydrogenous media. C. H. WESTCOTT (Proc. Camb. Phil. Soc., 1937, 33, 122—136).—Theoretical. The space distribution of slow neutrons is calc. by the application of diffusion laws to their motion. Calc. distribution is compared with that observed by Bjerger and Westcott (A., 1935, 1186) and the total absorption cross-section of the H_2O mol. is calc. to be 6×10^{-25}

sq. cm. Results indicate that absorption is mainly due to H atoms. O. D. S.

Absorbability in cadmium of neutrons slowed down in water and boric acid solutions. C. H. WESTCOTT (Proc. Camb. Phil. Soc., 1937, 33, 137—139).—The absorption by Cd of neutrons slowed down by different thicknesses of H_2O and of aq. solution of H_3BO_3 has been measured. Results are in agreement with Westcott's theory of the distribution of neutrons (cf. preceding abstract), and indicate that practically all neutrons of groups A and B have energies $>$ the max. energy of neutrons in group C. O. D. S.

Absorption of slow neutrons. E. FERMI and E. AMALDI (Ric. sci. Prog. tecn., 1935, [ii], 6, 443—447; Chem. Zentr., 1936, i, 2687; cf. this vol., 161).—Data for absorption by Rh, Ag, Cd, In, Ir, Au, and Hg are given. H. J. E.

Selector of velocity of slow neutrons. E. SEGRÈ (Atti R. Accad. Lincei, 1936, [vi], 24, 282—286; cf. A., 1936, 264).—A more detailed account of the theory of the method previously described. O. J. W.

Nuclear transformation of boron by slow neutrons. O. HAXEL (Z. Physik, 1937, 104, 540—548).—Absorption of slow neutrons by B gives rise to 2 α -particles and a Li particle group, the latter traceable to an excited 7Li nucleus. The intermediately formed ${}^{11}B$ nucleus has a life period $<1/30$ sec. L. G. G.

Emission of positrons. K. SHINOHARA (Sci. Papers Inst. Phys. Chem. Res., Tokyo, 1937, 31, 174—186).—The nos. of natural positrons from Ra-C and Th-B + C were, respectively, 4.7×10^{-4} and 4.2×10^{-4} times the nos. of electrons emitted from the same sources. The nos. of positrons from a thick piece of Pb by pair production by γ -rays were 1.0 and 2.2 times the nos. of positrons from the Ra-C and Th-B + C sources, respectively. H. J. E.

Production of artificial α -rays by resonance. E. WILHELMY (Naturwiss., 1937, 25, 173—174).—The transformation ${}^{14}N(n, \alpha){}^{11}B$ was investigated with a N_2 -filled ionisation chamber in conjunction with an amplifier and recording oscillograph. The distribution of α -particles and nuclei with the total energy of the two is obtained. Four max. are found in the curve, which are due to excited states of ${}^{15}N$ formed intermediately. A. J. M.

Excitation of a lithium atom by collision with a slow α -particle. J. W. FRAME (Proc. Camb. Phil. Soc., 1937, 33, 115—121).—Mathematical. The cross-section for excitation is calc. according to the theory of Mott (A., 1931, 1349). Vals. at low α -particle velocities are those calc. by Born's method of approximation. O. D. S.

Artificial radioactivity. K. LOSKIT (Eesti Rohut., 1935, 311—313; Chem. Zentr., 1936, i, 2499—2500).—A summary and review. H. J. E.

Detection of artificial radioactivity in a photographic emulsion. T. TAKEUCHI and T. INAI (Proc. Phys.-Math. Soc. Japan, 1935, 17, 319—320).—Tracks due to α - and induced radioactive particles

formed by neutron bombardment are found in photographic emulsions. CH. ABS. (e)

Further atomic transmutations by means of γ -rays. W. BOTHE and W. GENTNER (Naturwiss., 1937, 25, 191; cf. this vol., 162).—Further transmutations have been brought about by means of intensive γ -rays from Li. Zn gave ${}^{63}Zn$ (?) (38 min.); Ga, ${}^{70}Ga$ (20 min.) and ${}^{68}Ga$ (1 hr.); In, ${}^{112}In$ or ${}^{114}In$ (1 min.); Te, ${}^{127}Te$ or ${}^{129}Te$ (1 hr.); Ta, ${}^{180}Ta$ (14 min.). Mo gave a nucleus as yet unidentified (17 min.) (half-life periods in parentheses).

A. J. M.

Apparatus for high-velocity corpuscular rays and transmutation experiments therewith. W. BOTHE and W. GENTNER (Z. Physik, 1937, 104, 685—693).—An apparatus for the production of positive rays with energies up to 500 kv. is described. γ -Ray intensity-voltage curves for bombardment of F (CaF_2), Li, and B with protons were obtained. H. C. G.

Energy and absorption of the γ -radiation from ${}^7Li + {}^1H$. L. A. DELSASSO, W. A. FOWLER, and C. C. LAURITSEN (Physical Rev., 1937, [ii], 51, 391—399).—A study of the pairs ejected from foils in a Wilson chamber gives more reliable information on high-energy γ -radiation than is obtained from recoil electrons (cf. A., 1935, 1186), and shows that the γ -radiation from ${}^7Li + {}^1H$ consists of a line at 17.1 ± 0.5 m.e.v. of relative intensity 0.75 and probably one or more lines at about 14 m.e.v. of relative intensity 0.25. No radiation is found over 2—10 m.e.v. Electron and energy distributions agree with theory. An improved method of measuring absorption coeffs. for radiation >3 m.e.v. is described. Data can be interpreted by assuming that the proton is captured by the 7Li nucleus producing a 8Be nucleus in an odd state, and this may drop to the ground state with emission of 17 m.e.v. radiation.

N. M. B.

γ -Radiation from fluorine bombarded with protons. L. A. DELSASSO, W. A. FOWLER, and C. C. LAURITSEN (Physical Rev., 1937, [ii], 51, 527).—Investigations previously reported (cf. preceding abstract) are extended to ${}^{19}F + {}^1H$. A thick target was bombarded with 0.75 m.e.v. protons. The energy distribution of pairs and single electrons is plotted and indicates a single line at 6.0 ± 0.2 m.e.v. The resonance level at 0.328 m.e.v. is discussed. The suggested reaction is ${}^{19}F + {}^1H \rightarrow ({}^{20}Ne)'$ (${}^{20}Ne$)'' \rightarrow ${}^{16}O + {}^4He$.

N. M. B.

Resonance process in the disintegration of boron by protons. J. H. WILLIAMS, W. H. WELLS, J. T. TATE, and E. L. HILL (Physical Rev., 1937, [ii], 51, 434—438; cf. A., 1936, 1045).—An investigation of the efficiency of the two processes of production of α -particles from B as a function of the energy of the bombarding protons shows an irregularity in the curve for one of the processes indicating a resonance with peak at 180 kv. Theory is discussed and abs. yields for thick B targets at various energies are given.

N. M. B.

Radioactivity induced in silver by neutrons. G. GUEBEN (Ann. Soc. Sci. Bruxelles, 1937, 57, 22—24; cf. this vol., 107).—Ag foils were subjected to the

action of neutrons for various times with and without the interposition of paraffin. For short exposures (10 sec.—2 min.) without paraffin, radio-Rh with half-life 46 ± 4 sec. was obtained by the reaction ${}^4_2\text{Ag} + {}^1_0\text{n} \rightarrow {}^4_2\text{Rh} + {}^1_2\text{He}$. The half-life of the element obtained by the use of slower neutrons (with paraffin) was 31 ± 3 sec. For longer exposures (>15 min.) a radio-Ag with half-life 2.5 min. and one with half-life 50 sec. were obtained without paraffin, and one with half-life 30 sec. was produced with paraffin. Radio-Ag is produced by the reaction ${}^4_2\text{Ag} + {}^1_0\text{n} \rightarrow {}^4_2\text{Ag} + {}^1_2\text{He}$.

A. J. M.

Induced radioactivity of calcium. H. WALKER (Physical Rev., 1937, [ii], 51, 439—445).—Radioactivities induced in Ca by bombardment with high-energy deuterons, α -particles, and neutrons are reported. After irradiation by deuterons, the active samples were separated chemically into fractions containing Sc, Ca, and K. Most of the activity was found in the Sc ppt., the decay curve giving three components with half-lives 53 ± 3 min., 4.0 ± 0.1 hr., and 52 ± 2 hr.; the thick target yields, calc. for infinite duration of bombardment, are 5.4×10^7 , and 3×10^8 deuterons per active atom; the periods are probably associated with ${}^{44}\text{Sc}$, ${}^{43}\text{Sc}$, and ${}^{41}\text{Sc}$, respectively. The active Ca is due to ${}^{45}\text{Ca}$ of half-life 2.4 ± 0.2 hr., and thick target yield 9.0×10^8 deuterons per active atom. The yield of ${}^{43}\text{Sc}$ is one active atom for 2×10^9 α -particles. ${}^{45}\text{Ca}$ has also been produced by activating Ca with slow neutrons and by bombarding Ti with fast neutrons. The 16-hr. period previously reported (cf. Hevesy, A., 1935, 678) was probably due to Mg or Na impurities and not to ${}^{42}\text{K}$.

N. M. B.

Negative protons in cosmic radiations. H. J. BHABHA (Nature, 1937, 139, 415—416).—Benedetti's results (Physical Rev., 1934, 45, 214) lead to the view that either negative protons or some other negatively charged particles hitherto unknown are present in appreciable numbers in cosmic radiation.

L. S. T.

Dependence of energy of bundles of cosmic rays on angle. K. SCHMEISER (Naturwiss., 1937, 25, 173).—The existence of particles with high penetrating power when ultra-radiation is passed through a C filter (Hilgert *et al.*, A., 1936, 658) is due not to any special property of C but to the divergence angle between the particles in the bundle. This has been confirmed using Pb as the secondary radiator.

A. J. M.

Absolute intensity of ionisation by cosmic radiation at sea level. J. CLAY and H. F. JONGEN (Physica, 1937, 4, 245—255).—The ionisation in air \propto the pressure (1—38 atm.). The abs. ionisation for air at 1 atm. was 1.10 ± 0.04 ions per c.c. per sec.

H. J. E.

Multiplicative showers. J. F. CARLSON and J. R. OPPENHEIMER (Physical Rev., 1937, [ii], 51, 220—231).—Mathematical. The following topics are examined: quantum formulae for pair production and radiation for cosmic-ray energies; diffusion equations for the equilibrium of electrons and γ -rays and their solution to give distribution data; effect of ionisation losses on the shower and low-energy radiation expected.

N. M. B.

Hoffmann collisions and multiplication of rays. J. BOGGILD and A. KARKOV (Naturwiss., 1937, 25, 153; cf. A., 1936, 1315).—Hoffmann collisions produced from Pb were passed on to Al as adsorbent, and the effect of bringing more Pb under the Al was examined.

A. J. M.

Secondary effects of cosmic rays in free air and underground. P. AUGER and (MME.) G. MEYER (Compt. rend., 1937, 204, 572—573; cf. A., 1936, 1174).—The effect of the thickness of a Pb screen on the frequency of secondary cosmic showers produced in it has been investigated. Results obtained above and below ground level are compared and discussed.

A. J. E. W.

Geiger-Müller counter measurements of cosmic-ray intensities in the stratosphere. W. F. G. SWANN, G. L. LOCHER, and W. E. DANFORTH (Physical Rev., 1937, [ii], 51, 389—390).—A report of data obtained in three recent stratosphere balloon flights.

N. M. B.

Nature of the soft component of cosmic radiation. C. G. MONTGOMERY and D. D. MONTGOMERY (Physical Rev., 1937, [ii], 51, 217—219).—Calculations show that the primary corpuscles which lose energy according to Swann's theory (cf. this vol., 109) are probably protons.

N. M. B.

Absorption of cosmic rays in rock-salt. S. ZIEMECKI (Acta phys. polon., 1935, 4, 183—193; Chem. Zentr., 1936, 1, 2895—2896).—Absorption coeffs. are recorded, and the significance of the measurement is discussed.

J. S. A.

Electronic periodic table. C. H. D. CLARK (Proc. Leeds Phil. Soc., 1937, 3, 281—292).—A table is presented, giving the electron configurations of atoms, excluding those of the rare earths, in their ground states by means of their positions in the table. The electrons are divided into three groups, and the nature and no. of electrons in these determine the periods and groups of the older table. Ten chemical propositions are interpreted in terms of the groups. At. spectral theory and chemical properties, as expressed by the table, are correlated.

N. M. B.

Atomic nucleus. V. A. PLOTNIKOV (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 463—470).—Theoretical.

R. T.

So-called "earth rays." W. FRENZEL (Umschau Wiss. Tech., 1935, 39, 995—997; Chem. Zentr., 1936, i, 2896).—Biological effects of a hypothetical earth radiation are discussed.

J. S. A.

Secondary electrons of the neutrino. M. WOLKE (Acta phys. polon., 1935, 4, 177—182; Chem. Zentr., 1936, i, 2892).—The energy distribution of the secondary electron emission of Ra-E is displaced considerably towards high energies, as compared with the β -radiation, in agreement with the conception of the liberation of secondary electrons by head-on collision with neutrinos.

J. S. A.

Collision between light quanta and free electrons. D. HACMAN (Bul. Fac. Ştiinţe Cernăuţi, 1935, 9, 360—375; Chem. Zentr., 1936, i, 3081).—By the intersection of a beam of visible light with a

stream of slow electrons in vac., the predicted Compton effect has been qualitatively confirmed. J. S. A.

Fermi's theory of the β -disintegration. M. FIERZ (Z. Physik, 1937, 104, 553—565).—Mathematical. J. G. G.

Energy and impact principles of collisions between particles resulting in radiation and pair formation. W. BRAUNBEK (Z. Physik, 1937, 104, 619—637).—Mathematical. L. G. G.

Virial theorem in nuclear problems. E. L. HILL (Physical Rev., 1937, [ii], 51, 370—371; cf. A., 1936, 919).—Mathematical. The extension of the virial theorem to include exchange forces is reported. N. M. B.

Transformations of elements in the interior of stars. I. C. F. VON WEIZSÄCKER (Physikal. Z., 1937, 38, 176—191).—It is assumed that the energy of stars is maintained by the building up of elements from H_2 . This hypothesis is supported by the fact that many stars contain large amounts of H_2 . The lighter elements can be built up directly from H_2 , whilst the heavier ones can be formed by the action of neutrons on the lighter nuclei. The source of neutrons is largely D, the reaction being ${}_1^2D + {}_1^2D = {}_2^3He + n$. The nuclear reactions occurring within the star depend largely on the properties of the nucleus of mass 5. Cycles of transformations occur, such as ${}_2^3He + {}_1^3H = {}_3^6Li$; ${}_3^6Li = {}_2^4He + {}_1^2H$; ${}_2^4He + {}_1^3H = {}_3^7Li$; ${}_3^7Li = {}_2^4He + {}_1^3H$. The ${}_2^4He$ maintains the cycle, and the ${}_1^2D$ acts as a source of neutrons, as above. The factors deciding the production of the heavier nuclei by neutron collision are considered, and the theory is applied to the explanation of the frequency of occurrence of the various elements in stars. A. J. M.

Isobars. V. A. PLOTNIKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 189—191).—Theoretical. The formation of all known isobars can be explained by the action of two alternative intranuclear processes: 4 neutrons = α -particle + 2 electrons and 2 neutrons = deuteron + electron, the electrons being subsequently ejected. O. D. S.

Energy exchange of helium, neon, and argon atoms with a metal surface. G. ZACHARIIN and G. SPIVAK (Physikal. Z. Sovietunion, 1936, 10, 495—509).—Data for the accommodation coeffs. at 300—650° abs. of He, Ne, and Ar on clean W, and on W pretreated with N, O, and H, are recorded. H. J. E.

Interaction in heavy atomic nuclei. H. EULER (Naturwiss., 1937, 25, 201).—Assuming the same force between two protons or two neutrons as between a proton and a neutron the binding energy of heavy at. nuclei can be calc. The Thomas-Fermi approximation is improved. A. J. M.

Intermediate nucleus in the disintegrative synthesis of atomic nuclei: disintegration in steps. W. D. HARKINS (Proc. Nat. Acad. Sci., 1937, 23, 120—131).—A detailed discussion of the postulates of a theory previously presented (cf. this vol., 109). N. M. B.

Emergence of low energy protons from nuclei. E. POLLARD (Physical Rev., 1937, [ii], 51, 291).—

Calculations indicate that the escape of low-energy protons from the composite nucleus in transmutations induced by α -particles (cf. this vol., 108) must be due to abnormally low proton barriers or to the composite nucleus containing the final product element and the proton having a finite lifetime long enough to allow the proton to leak through the barrier (cf. Harkins, *ibid.*, 109). N. M. B.

Resonance effects in nuclear processes. H. A. BETHE and G. PLACZEK (Physical Rev., 1937, [ii], 51, 450—484; cf. Breit, A., 1936, 658).—Mathematical. A general theory is developed and is applied to slow and fast neutrons, charged particles, and phenomena produced by γ -rays. N. M. B.

Magnitude of the new nuclear forces. H. VOLZ (Naturwiss., 1937, 25, 200—201).—The ratios and magnitudes of the Majorana, Wigner, Heisenberg, and Bartlett forces are derived. A. J. M.

Approximately relativistic equations for nuclear particles. G. BREIT (Physical Rev., 1937, [ii], 51, 248—262).—Mathematical. A complete relativistic theory of nuclear forces involves reference to the electron-neutrino field. Equations relativistically invariant for transformations involving low velocities are examined. N. M. B.

Generalisations of the β -transformation theory. G. GAMOW and E. TELLER (Physical Rev., 1937, [ii], 51, 289; cf. Konopinski, A., 1935, 1048).—In the emission of an electron in a β -transformation process, the possibility, in addition to the emission of a neutrino, of the emission of a pair of electrons ($n \rightarrow n + e^+ + e^-$ or $p \rightarrow p + e^+ + e^-$) and of a pair of neutrinos ($n \rightarrow n + \nu + \nu$ or $p \rightarrow p + \nu + \nu$) is discussed. N. M. B.

Determination of h/e from the short wavelength limit of the continuous X-ray spectrum. J. DU MOND and V. BOLLMAN (Physical Rev., 1937, [ii], 51, 400—429).—Two precision determinations of the short- λ limits of the continuous X-ray spectrum in the regions 10,000 and 20,000 volts, respectively, by the method of isochromats under very steady applied voltage are described in detail. The val. obtained for h/e , assuming the ruled grating $\lambda\lambda$ of X-rays to be correct, is $1.3762 \pm 0.0003 \times 10^{-17}$, and for e/h^2 , without this assumption, $2.0720 \pm 0.0004 \times 10^{10}$ (cf. Kirkpatrick, A., 1934, 586). N. M. B.

Quantum limit of the continuous spectrum. P. KIRKPATRICK and P. A. ROSS (Physical Rev., 1937, [ii], 51, 529; cf. A., 1934, 586).—A feature in the isochromats as reported by Du Mond (see preceding abstract) is discussed. N. M. B.

Cosmological constants. P. A. M. DIRAC (Nature, 1937, 139, 323). L. S. T.

Spontaneous disintegration of photons. M. BRONSTEIN (Physikal. Z. Sovietunion, 1936, 10, 686—688).—From the fact that the relative λ shift, $d\lambda/\lambda$, towards the red observed in the spectra of spiral nebulae is const. throughout the spectrum, it is shown that the spontaneous disintegration of photons postulated by Halpern and Heitler is impossible. H. C. G.

Impulse moments in L. de Broglie's theory of the photon. J. GÉHÉNIAU (Compt. rend., 1937, 204, 665—668).—Mathematical. A. J. E. W.

Equations of the photon. J. ROUBAUD-VALETTE (Compt. rend., 1937, 204, 747—749).—Mathematical. A. J. E. W.

Relations between the polarisation of a photon and the spins of the constituent corpuscles. J. ROUBAUD-VALETTE (Compt. rend., 1937, 204, 483—485).—Mathematical. A. J. E. W.

Electronic photon. J. J. PLACINTEANU (Compt. rend., 1937, 204, 485—487; cf. A., 1936, 660; this vol., 110).—Mathematical. A. J. E. W.

Neutrino theory of light. II. M. BORN and N. S. N. NATH (Proc. Indian Acad. Sci., 1936, 4, A, 611—620; cf. A., 1936, 774).—Mathematical. J. W. S.

Spherical symmetry of self-consistent atomic fields. A. F. STEVENSON (Physical Rev., 1937, [ii], 51, 285—287).—Mathematical. N. M. B.

Kinetic energy of nuclei in the Hartree model. H. A. BETHE and M. E. ROSE (Physical Rev., 1937, [ii], 51, 283—285).—Mathematical. The separation of the kinetic energy of the centre of gravity from the total kinetic energy of the nucleus for calculations of nuclear energy levels by the Hartree method is discussed. N. M. B.

Equations for the Dirac electron in general relativity. H. YAMAMOTO (Japan. J. Physics, 1936, 11, 35—65).—Mathematical. A. J. M.

Modern values of the atomic constants e and h . R. LADENBURG (Ann. Physik, 1937, [v], 28, 458—464).—A review of recent determinations of e and h . The best val. of e is 4.803×10^{-10} e.s.u. Use of this val. in (1) Bohr's formula for the Rydberg const. and (2) calculations based on determinations of the limiting frequency of the continuous X-ray spectrum leads to $h = 6.627 \times 10^{-27}$ and 6.609×10^{-27} erg per sec., respectively. This latter discrepancy, far outside the probable errors of either method, is unexplained. L. G. G.

Methods of estimation of nuclear statistics. T. SEXL (Naturwiss., 1937, 25, 153—156).—The estimation of nuclear statistics from variation of intensity of the band spectra of diat. mols., the sp. rotation heat of a gas, and the scattering of similar particles (e.g., nuclei by nuclei) is discussed. A. J. M.

Relativistic wave functions in the continuous spectrum for the Coulomb field. M. E. ROSE (Physical Rev., 1937, [ii], 51, 484—485).—Mathematical. The continuous spectrum solutions, in the form of series and integral representations and the asymptotic behaviour at large distances, of the Dirac wave equation are given. N. M. B.

Quantum equations in cosmological spaces. A. H. TAUB (Physical Rev., 1937, [ii], 51, 512—525).—Mathematical. The Dirac equations for a free electron in a cosmological space are solved by separation of variables and deductions are developed. N. M. B.

Waves and corpuscles in quantum physics. A. LANDÉ (Science, 1937, 85, 210—213). L. S. T.

Calculation of constants for band spectra. C. H. D. CLARK (Nature, 1937, 139, 508—509).—An empirical formula connecting the fundamental vibration frequencies of di-atoms that belong to symmetrical mol. groups is discussed. L. S. T.

Relation between the variations of intensity of solar ultra-violet radiation, measured at ground level, and the pollution of the lower atmosphere. L. HERMAN and (MLLE.) F. BERNSTEIN (Compt. rend., 1937, 204, 708—710).—Parallelism between the annual variation of the intensity of solar radiation in the neighbourhood of 3200 Å., and the pollution of the lower atm., indicates that absorption of these $\lambda\lambda$ is chiefly due to dust and smoke particles. A. J. E. W.

Molecular excitation potentials of water vapour. N. THORLEY and R. WHIDDINGTON (Proc. Leeds Phil. Soc., 1937, 3, 265—269).—Measurement of the electron impact spectrum in H₂O vapour gives excitation potentials of 7.60, 10.15, and 13.55 volts, and a faint ionisation potential at 16.75 volts. The first ionisation potential, estimated from photometer traces, is 12.35 volts. Correlation of results with ultra-violet absorption spectra and excitation interpretation are discussed. N. M. B.

Absorption spectrum as a test for free radicals. O. OLDENBERG (J. Physical Chem., 1937, 41, 293—297).—A discussion of the effects of concn. and impurities on the problem of recognising OH and H radicals by their absorption spectra. F. R. G.

Limiting curve for dissociation based on band spectra. R. SCHMID and L. GERO (Z. Physik., 1937, 104, 724—734).—Consideration of the relationship between the predissociation limit of the CO spectrum at 11.06 volts and mol. vibrational, rotational, and transitional energy leads to a "limiting curve of dissociation." The properties of this curve are discussed. H. C. G.

Perturbations in the band spectra of CS, CO⁺, and N₂. L. GERO (Math. nat. Anz. ung. Akad. Wiss., 1935, 53, 331—351; Chem. Zentr., 1936, i, 2693). H. J. E.

Emission of CO⁺ bands from the head of the Peltier comet (1936, a). J. DUFAY, (MLLE.) M. BLOCH, and J. ELLSWORTH (Compt. rend., 1937, 204, 663—665).—14 band systems in the range 3790—5000 Å., ascribed to CO⁺, were observed. Their occurrence is discussed. A. J. E. W.

New absorption system of cyanogen gas in the near ultra-violet. System I. S. C. WOO and T. K. LUI (J. Chem. Physics, 1937, 5, 161—165).—Two main progressions of bands with frequency differences 2050 cm.⁻¹ and 895 cm.⁻¹ are reported in a new system of bands found between 3020 and 2400 Å. with an absorbing path of 3 m. at 2 atm. The structure of the mol. in the excited state, its normal frequencies and symmetry properties are discussed. W. R. A.

Band spectra of ionised halogen hydrides. II. Hydrogen chloride and deuterium chloride. F. NORLING (Z. Physik, 1937, 104, 638—652; cf. A., 1935, 913).—The ultra-violet bands of HCl and DCl were photographed with a dispersion of 0.95 Å. per

mm. A modification of the hollow-cathode discharge tube was used. Discharge conditions for max. definition of the weaker bands are discussed. Results are employed to calculate accurate mol. consts.

H. C. G.

Absorption spectrum of chlorine trioxide and chlorine hexoxide. C. F. GOODEVE and F. D. RICHARDSON (Trans. Faraday Soc., 1937, 33, 453—457).— ClO_3 absorbs in the ultra-violet region with a threshold at about 3500 Å. and two max. at 2760 and 2000 Å., respectively. Liquid Cl_2O_6 absorbs strongly from 6000 to <2200 Å.

J. W. S.

Band spectrum of magnesium hydride. A. GUNTSCHE (Z. Physik, 1937, 104, 584—591).—Seven bands in the $^2\Pi-^2\Sigma$ -system of Mg hydride have been measured and in part analysed. Rotation and nuclear oscillation consts. have been determined and thence accurate ρ^2 vals. for Mg deuteride calc. A-separation consts. for the hydride were calc. and compared with those of the deuteride. A new band, arising from a $^2\Sigma-^2\Pi$ transition, was found at λ 4400.

H. C. G.

$^1\Sigma^*$ —**Band system of ionised cadmium deuteride.** R. V. ZUMSTEIN, J. W. GABEL, and R. E. MCKAY (Physical Rev., 1937, [ii], 51, 238—240).—Data and analyses for eight bands of the system in the range $\lambda\lambda$ 2630—2280 are tabulated. The electronic isotope displacement relative to Cd^+H is probably 4.4 cm^{-1}

N. M. B.

Excitation of CuCl bands by fluorescence in cuprous chloride vapour. J. TERRIEN (Compt. rend., 1937, 204, 565—567; cf. A., 1935, 681).—The CuCl bands are excited by light of λ <2370 Å., the intensity of the bands increasing towards the violet with lower exciting $\lambda\lambda$. The fluorescence is probably due to the reaction $\text{Cu}_2\text{Cl}_2 + h\nu \rightarrow \text{CuCl} + (\text{CuCl})^*$.

A. J. E. W.

Excitation by resonance of the fundamental doublet of copper in cuprous chloride vapour. J. TERRIEN (Compt., rend., 1937, 204, 679—682).—The fluorescence spectrum of Cu_2Cl_2 vapour, excited by ultra-violet radiation, contains CuCl bands (cf. preceding abstract) and the 3248—3274 Å. doublet of Cu. The emission of the latter is due to resonance of Cu atoms produced by photo-dissociation of Cu_2Cl_2 .

A. J. E. W.

Band spectra of SbF and BiF. G. D. ROCHESTER (Physical Rev., 1937, [ii], 51, 486—490).—Data and analyses for new band spectra of SbF and BiF excited by active N are tabulated. The 2000—5500 Å. SbF spectrum gives three groups of bands, 3600—5200, 2600—2700, and 2200—2430 Å. BiF gives three systems of bands, 3050—3250, 2650—2850, and 2250—2350 Å., degraded to shorter $\lambda\lambda$ and forming a triplet system with wide multiplet separations (7330 and 4800 cm^{-1}). Vibrational consts. for two systems of the SbF bands are calc.

N. M. B.

Spectra of neutral and ionised boron hydride. G. M. ALMY and R. B. HORSFALL, jun. (Physical Rev., 1937, [ii], 51, 491—500; cf. Thunberg, A., 1936, 920).—Wave nos. and quantum assignments are tabulated for the $^1\Pi \rightarrow$ and $^3\Sigma \rightarrow ^3\Pi$ systems of BH and a new system $^2\Pi \rightarrow ^2\Sigma$ due to BH^+ . The first

has been extended to include the (2, 2) band, and the calc. heat of dissociation of the normal state is 3.60+0.05 e.v. The fine multiplet structure of the second system has been resolved; the (0, 0) head is at λ 3694. The third system is analogous to the green bands of the isoelectronic mol. BeH; the (0, 0) head is at λ 3766. Theory and the calculation of consts. are discussed.

N. M. B.

Molecular emission spectra of metallic salts. P. MESNAGE (Compt. rend., 1937, 204, 761—763; cf. A., 1935, 1051, 1187).—The spectra of MnCl_2 , FeBr_2 , and FeI_2 are described, and $\lambda\lambda$ of the principal bands given.

A. J. E. W.

2700 Å. absorption bands of chlorine compounds in aqueous solution. A. TOURNAIRE (Rev. Opt. théor. instr., 1935, 14, 436—442; Chem. Zentr., 1936, i, 2694).—Aq. LiCl , NaCl , BeCl_2 , CaCl_2 , MgCl_2 , SrCl_2 , and BaCl_2 have an absorption band at 2800—2600 Å. (max. 2700). That for LiCl is independent of temp. (20—100°) but is intensified by adding HCl. Br and I compounds have weaker bands at $\lambda\lambda$ 3000 and 3500 Å., respectively, as well as bands in the far ultra-violet.

H. J. E.

Variation of absorption spectra of substances in solution, and subsidiary valency as the cause of it. G. SCHEIBE (Angew. Chem., 1937, 50, 212—219).—The widening of absorption spectra of substances when dissolved in different solvents is discussed with reference to the van der Waals forces between solute and solvent. The effect of these forces in causing polymerisation is considered.

A. J. M.

Third absorption bands of co-ordination compounds. III. Configuration of $[\text{Codg}'_2\text{NH}_3\text{Cl}]$. New type of optically active complex radicals. R. TSUCHIDA and M. KOBAYASHI (Bull. Chem. Soc. Japan, 1937, 12, 83—85; cf. this vol., 110).—A third absorption band at $\nu = 121 \times 10^{13}$ has been found in aq. solutions of $[\text{Codg}'_2\text{NH}_3\text{Cl}]$ ($\text{dg}' =$ dimethylglyoxime anion). Consequently a *trans* configuration is now assigned to the compound, which thus represents a new type of complex resolvable by asymmetric adsorption on quartz powder.

F. L. U.

Energy states of solids with particular reference to the energy states of $\text{Nd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$. F. H. SPEDDING, H. F. HAMLIN, and G. C. NUTTING (J. Chem. Physics, 1937, 5, 191—198).—The absorption spectrum of $\text{Nd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ crystals has been photographed at 20°, 78°, 169°, and 298° abs. The observed multiplets are modified by the electrical field of the crystal lattice. They are not in accord with vals. of Penney and Schlapp (A., 1932, 985) calc. from paramagnetic susceptibility data. Revised methods of interpreting the measurements of Gorter and de Haas are suggested.

W. R. A.

Absorption of acetone solution in the short-wave ultra-violet. H. MOHLER (Helv. Chim. Acta, 1937, 20, 285—287).—Observations on COMe_2 in hexane confirm the results of Ley and Arends (A., 1931, 408). The band at 187 μ has fine structure.

E. S. H.

Ultra-violet absorption spectra of iodoform and of other tri-iodides in solution. R. H. POTTERILL and O. J. WALKER (Trans. Faraday Soc., 1937, 33, 363—371).—The absorption spectra of CHI_3 and of CMeI_3 in EtOH and in cyclohexane solution over the range 2000—4000 Å. are very similar to one another, but differ from the I_3' absorption spectrum. The absorption spectra of PI_3 , AsI_3 , and SbI_3 in cyclohexane have also been measured. Nearly all mols. containing 3 or 4 I atoms linked to a central atom have two absorption bands in the region 2800—4000 Å, but their max. vary with the nature of the central atom. J. W. S.

Ultra-violet absorption spectra of the molecules $\text{CH}_3\cdot\text{NH}_2$, $\text{CD}_3\cdot\text{NH}_2$, $\text{CH}_3\cdot\text{ND}_2$, and $\text{CD}_3\cdot\text{ND}_2$. T. FORSTER and J. C. JUNGERS (Physikal. Z., 1937, 38, 140—141).—The frequencies of bands in the ultra-violet absorption spectra of the above mols. may be expressed by $\nu = n_1\omega_1 + n_2\omega_2$ where ω_1 and ω_2 are the fundamental frequencies, and n_1 and n_2 are integers. The vals. of ω_1 and ω_2 (in cm^{-1}) are, for NH_3Me 668 and 1015, for $\text{NH}_2\cdot\text{CD}_3$ 610 and 871, for $\text{ND}_2\cdot\text{CD}_3$ 500 and 823, and for ND_2Me , 516 and approx. 1000, respectively. A. J. M.

Spectrochemical study of colours derived from quinoneimine. T. UÉMURA and M. ABÉ (Bull. Chem. Soc. Japan, 1937, 12, 59—70; cf. A., 1935, 913).—Absorption curves have been determined over the range λ 2500 to 6000 Å. for solutions of $\text{NH}\cdot\text{C}_6\text{H}_4\cdot\text{O}$ (I) and $\text{NH}\cdot\text{C}_6\text{H}_4\cdot\text{NH}$ (II), and of derivatives formed by substituting Me, Cl, Ph, $\text{NH}_2\cdot\text{C}_6\text{H}_4$, $\text{NMe}_2\cdot\text{C}_6\text{H}_4$, and $\text{NHPh}\cdot\text{C}_6\text{H}_4$ in the NH of (I), and Me, Cl, Ph, and $\text{C}_6\text{H}_3\text{Me}\cdot\text{OH}$ in one or both NH groups of (II). The effect of the various substituents on the absorption of the parent substances is described. F. L. U.

Spectrochemistry of nitrogenous substances. Absorption and structure of amides and imino ethers. (MLLE.) RAMART-LUCAS and M. GRUNFELD (Bull. Soc. chim., 1937, [v], 4, 478—481).—Comparison of the ultra-violet absorption spectra of mono- and di-substituted arylamides has not given information on the structure of these compounds. E. S. H.

Fluorescence of cyclohexane. S. M. MITRA (Phil. Mag., 1937, [vii], 23, 558—562).—Two bands are observed using Hg light, one intense in the ultra-violet $\lambda\lambda$ 3342—2650 Å., max. 2900 Å., due to fluorescence of cyclohexane; the other weak in the blue-violet, max. λ 4000 Å., due to a photodecomp. product. F. J. L.

Chemical war materials. IV. Absorption of $\beta\beta'$ -dichlorodiethyl sulphide in the short-wave ultra-violet. H. MOHLER (Helv. Chim. Acta, 1937, 20, 287—288; cf. A., 1936, 545).—Solutions of $(\text{CH}_2\text{Cl}\cdot\text{CH}_2)_2\text{S}$ in hexane and in EtOH have absorption bands at 202 and 180 μ . E. S. H.

Absorption spectra of certain hydronaphthalenes. W. KEMULA and B. L. DUNICZ (Rocz. Chem., 1937, 17, 36—41).—Morton's results (A., 1934, 941) for 1:2- and 1:4-di- (I) and 1:2:3:4-tetrahydronaphthalene (II) are on the whole confirmed, except that new bands at λ 258.5 have been found for (I) and (II), and that the bands at λ 283 and 287 μ ,

found by Morton for (II), are due to presence of C_{10}H_8 in the (II). R. T.

Absorption and deformation of valency angles in the case of phenylhydrazones. (MMR.) RAMART-LUCAS, J. HOCH, and M. MARTYNOFF (Bull. Soc. chim., 1937, [v], 4, 481—499).—The absorption spectra of several phenylhydrazones, methylphenylhydrazones, and aminoanils have been determined. All the hydrazones studied have the structures usually ascribed to them; if isomerides are formed they can exist only in small proportions. Variations of absorption with the no. and nature of radicals bound directly to the $\text{C}\cdot\text{N}\cdot\text{N}\cdot\text{CH}$ group are ascribed to deformation of valency angles or rearrangement of electrons. E. S. H.

Absorption of $\text{R}_1\text{—R}_1$ systems. I. Spectra of cholestenone, cholestenoneoxime, mesityl oxide, pulegone, and carvone. H. MOHLER (Helv. Chim. Acta, 1937, 20, 289—293).—Absorption spectra for solutions in hexane and in EtOH have been determined. E. S. H.

Ultra-violet absorption of binary liquid mixtures. X. System benzene-heptane. M. PESTEMER and T. LANGER (Monatsh., 1937, 70, 20—25; cf. A., 1935, 428).—Measurements on 8 mixtures indicate that Beer's law is obeyed at low, but not at high, $[\text{C}_6\text{H}_6]$ in these mixtures. J. W. S.

Re-emission of visible light and the coloration by ultra-violet light of certain crystals. J. H. HIBBEN (Physical Rev., 1937, [ii], 51, 530).—Large MgO crystals under ultra-violet radiation, particularly Hg 2536 Å., become deep purple. On removing the source, decolorisation begins, very rapidly initially, but at a rate decreasing as a function of time. There is simultaneous emission of light in the visible and into the near infra-red. The rate of re-emission is markedly increased at higher temp., or by irradiation of the coloured crystal by Hg 4358 Å. The phenomenon is attributed to a type of electron migration and recombination. N. M. B.

Absorption of ionic crystals in the ultra-violet. E. G. SCHNEIDER and H. M. O'BRYAN (Physical Rev., 1937, [ii], 51, 293—298; cf. Hilsch, A., 1930, 395).—Absorption curves for <1600 Å., were obtained for alkali halides in the form of films of approx. 0.05 μ thickness distilled on to LiF plates 1 mm. thick which are transparent to 1050 Å. Additional bands below 1600 Å. of widths 0.3—1.3 e.v. were found. Results are in agreement with calculations (cf. Hippel, this vol., 8). Mg, Ca, Ba, Zn, Cu, and Ag halides show only a series of sharp absorption edges with continuous absorption towards shorter $\lambda\lambda$. N. M. B.

Theory of coloured crystals. D. BLOCHINZEV (Physikal. Z. Sovietunion, 1936, 10, 431—441).—Theoretical. H. J. E.

Binding of excess of potassium in potassium halide crystals. O. STASIW (Nachr. Ges. Wiss. Gottingen, Math.-phys. Kl., 1936, 2, 1—7; Chem. Zentr., 1936, i, 2699).—Migration of excess of K atoms into alkali halide crystals containing Tl produces new absorption centres. H. J. E.

Velocity of exchange of protons and deuterons between water molecules. K. WIRTZ (Z. Physik, 1937, 104, 613—618).—The transmission of a 50% mixture of H_2O and D_2O at $1.7\ \mu$ was measured as soon after mixing as possible (20 sec.). No change was observed on keeping. At this λ transmissions of H_2O , D_2O , and 50% mixture are in the ratios 13:36:17.5, respectively. All exchange reactions take place in <20 sec. H. C. G.

Reflecting power of H_2O , HDO , and D_2O in the infra-red spectrum. F. MATOSSI and H. BLUSCHKE (Z. Physik, 1937, 104, 580—583).—Measurements were made with a recording spectrograph and max. were found at $3.18\ \mu$ and $6.4\ \mu$ for H_2O , $4.18\ \mu$ and $8.6\ \mu$ for D_2O , and at $3.18\ \mu$, $4.18\ \mu$, and $7.25\ \mu$ for HDO . Results are discussed in relation to theory. H. C. G.

Absorption of liquid water between $2.5\ \mu$ and $6.5\ \mu$. E. GANZ (Ann. Physik, 1937, [v], 28, 445—457).—The bands of liquid water at $3\ \mu$, $4.7\ \mu$, and $6\ \mu$ have been investigated between 17° and 84° . Changes of λ from lower to higher temp. are approx. $-0.02\ \mu$, $+0.16\ \mu$, and $+0.04\ \mu$, respectively, for the three bands. The $4.7\ \mu$ band is considered to be due to water complexes, but its intensity is not much reduced even at 84° . Solutions of MgCl_2 , KI , and NaClO_4 ($\sim 10N$) were examined and the $4.7\ \mu$ band showed the greatest changes. A. E. M.

Position of the CH bands of halogenated derivatives of saturated hydrocarbons, and the electric moment of their molecules. P. BARCHEWITZ (Compt. rend., 1937, 204, 677—679; cf. A., 1927, 918; 1933, 1228).—The displacement of the CH bands depends on the disposition and magnitude of the electric moments of the individual bonds in the mol.; it is not directly related to the total moment of the mol., and is not a mass effect. A. J. E. W.

Deformation vibration of the acetylene molecule. W. H. J. CHILDS and H. A. JAHN (Z. Physik, 1937, 104, 804—806).—A criticism of Mecke and Ziegler (A., 1936, 1444). L. G. G.

Infra-red absorption of the hydrogen halides in organic solvents. D. WILLIAMS (Physical Rev., 1937, [ii], 51, 288; cf. this vol., 8).—The solubility of HBr and HI in PhCl , PhNO_2 , and $m\text{-C}_6\text{H}_4\text{Me}\cdot\text{NO}_2$ is very slight, but the fundamental frequencies appear to be lower than in the gas. In C_6H_6 solution the fundamental bands of HBr and HI appear at 3.9 and $4.5\ \mu$, respectively. In all cases the absorption coeff. of the dissolved gas was $>$ that of the free gas. The absorption of HCl was more intense than that of HBr or HI . In Et_2O solutions of HCl , HBr , and HI the solute bands were absent (cf. West, this vol., 112). N. M. B.

Infra-red absorption of liquid and gaseous 1:4-dioxan between 1.4 and $14.0\ \mu$. D. S. MCKINNEY, C. E. LEBERKNIGHT, and J. C. WARNER (J. Amer. Chem. Soc., 1937, 59, 481—484).—Investigation of the spectra shows little change in passing from liquid to gas, although there is a slight displacement in the direction of higher frequencies. E. S. H.

Infra-red bands in the $3\ \mu$ region. J. J. FOX and A. E. MARTIN (Nature, 1937, 139, 507).— PhOH , $\text{CH}_2\text{Ph}\cdot\text{OH}$, $\text{CHPh}_2\cdot\text{OH}$, and $\text{CPh}_3\cdot\text{OH}$ in CCl_4 give an intense OH band in the region $2.76\ \mu$ with the association band at $2.87\text{—}2.97\ \mu$, λ increasing with the intensity of the band. Replacement of H by Ph in $\text{CH}_2\text{Ph}\cdot\text{OH}$ appears to suppress intermol. association. L. S. T.

Influence of molecule association on infra-red absorption. A. MAIONE (Nuovo Cim., 1935, [ii], 12, 441—443; Chem. Zentr., 1936, i, 2695).—The $3\ \mu$ absorption band of EtOH increases in intensity in C_6H_6 solution to a max. at approx. 70% of C_6H_6 . H. J. E.

Infra-red spectrum of proteins. F. VLES and E. HEINTZ (Compt. rend., 1937, 204, 567—569; cf. A., 1935, 1053; 1936, 268).—The infra-red absorption curve of serum-albumin agrees well with that predicted from the absorption of the seven chief constituent NH_2 -acids. This result is discussed in relation to the structure of proteins. A. J. E. W.

Infra-red absorption spectra of four Grignard solutions. W. B. PLUM (J. Chem. Physics, 1937, 5, 172—178).—Four typical Grignard compounds in Et_2O solution and 8 related substances have been investigated between 1.0 and $13\ \mu$. All compounds containing Mg appear to have 4 characteristic frequencies; their origin is discussed. W. R. A.

Raman spectrum of ice-like (γ) and low-melting asbestos-like (δ) form of sulphur trioxide. H. GERDING and N. F. MOERMAN (Z. physikal. Chem., 1937, B, 35, 216—222; cf. A., 1936, 922).—The β -form probably consists chiefly of chains in which each S atom is singly linked with two O atoms forming part of the chain and doubly linked with two other O, the structure being similar to that of CrO_3 (cf. A., 1931, 789). R. C.

Raman spectrum of sulphur trioxide. H. GERDING, W. J. NIJVELD, and G. J. MULLER (Z. physikal. Chem., 1937, B, 35, 193—215).—Gaseous SO_3 has a single Raman frequency, $1069\ \text{cm}^{-1}$. The Raman spectrum of the liquid shows it to be a mixture of single mols. and polymerised mols., probably S_2O_6 . With rise in temp. equilibrium is shifted in favour of the single mols. (cf. A., 1936, 922). The SO_3 mol. has a plane structure. R. C.

Raman spectra of water, aqueous solutions, and ice. J. H. HIBBEN (J. Chem. Physics, 1937, 5, 166—172).—Raman spectra of water at 28° and 88° , ice, and aq. solutions of NaOH , Ba(OH)_2 , LiCl , KBr , MgCl_2 , and crystals of $\text{MgCl}_2\cdot 6\text{H}_2\text{O}$ and $\text{CdSO}_4\cdot 8/3\text{H}_2\text{O}$ have been investigated with particular reference to the low-frequency Raman shifts of the H_2O spectrum. These frequencies can be explained only on the basis of intermol. interaction and this explanation is further justified by consideration of the changes in intensity with temp. The existence of certain doubtful lines has been confirmed. W. R. A.

Depolarisation of Raman lines and structure of chlorate, bromate, and iodate ions. S. T. SHEN, Y. T. YAO, and T. Y. WU (Physical Rev., 1937, [ii], 51, 235—238).—Spectra are examined under high dispersion for the solutions, and the degree

of depolarisation is measured. The strong ClO_3 930 cm^{-1} line and the IO_3 800 cm^{-1} line in solutions each consist of two lines. The presence of four lines for each ion and the measured data indicate that the ions have a pyramidal structure (cf. Slater, A., 1931, 1113). Valency force consts. are calc. N. M. B.

Raman spectrum and structure of the metaborate ion. J. R. NIELSEN and N. E. WARD (J. Chem. Physics, 1937, 5, 201).—Examination of the Raman spectrum of aq. solutions of Na metaborate failed to confirm the existence of certain lines reported by Ghosh and Das (A., 1932, 675) which led these authors to conclude that the metaborate ion was triat. and non-linear. The presence of a single Raman frequency indicates that the ion is triat. BO_3^- , symmetrical and linear, and this frequency corresponds with the totally symmetrical vibration. Approx. vals. of the force const. and of the asymmetrical longitudinal vibration are given. Possible electronic structures are reviewed. The plane ring structure $(\text{B}_2\text{O}_6)^{-3}$, proposed by Zachariasen, is ruled out. W. R. A.

Werner complexes. Raman spectrum of four- and six-coordinate compounds. J. P. MATHIEU (Compt. rend., 1937, 204, 682—683).—Data for $[\text{Pt}(\text{NH}_3)_4]\text{Cl}_2$, $[\text{Pt}en_2]\text{Cl}_2$, $[\text{Rh}(\text{NH}_3)_6]\text{Cl}_3$, and $[\text{M}en_3]\text{Cl}_4$ (M = Pt, Rh, or Ir) are recorded and discussed. Planar and tetrahedral structures for 4-coordinate bivalent Pt cannot be distinguished by Raman spectra. A. J. E. W.

Raman spectra of molecular compounds. II. Elimination of "degeneracies" of normal vibration frequencies by angular symmetry deformations in intermolecular interaction. G. BRIEGLER and W. LAUPPE (Z. physikal. Chem., 1937, B, 35, 42—59; cf. A., 1936, 781).—Intermol. van der Waals forces may alter the symmetry of the mols. on which they act, and if these contain no rotatable groups the valency angles may be modified, resulting in a change in the no. of Raman-active normal vibration frequencies. Solutions of SnCl_4 in MeOH and Et_2O exhibit additional Raman frequencies, which are interpreted as normal vibration frequencies of SnCl_4 deformed by compound formation with the solvent, the symmetry changing possibly from T_d to C_2 . In the Raman spectrum of the compound of AlCl_3 with Et_2O the normal vibration frequencies of pure Et_2O are changed, suggesting an alteration in the symmetry and state of linking of the Et_2O by the AlCl_3 . R. C.

Scattering of light at the surface of separation of two liquids. F. BARICHANSKAJA (Physikal. Z. Sovietunion, 1936, 10, 666—672).—This is studied in $\text{PhOH-H}_2\text{O}$ and $\text{Pr}^n\text{CO}_2\text{H-H}_2\text{O}$ mixtures at temp. passing through the point of complete miscibility with light of λ 4000—6000 Å. The intensity of light scattered at the interface $\propto 1/\lambda^2$. L. G. G.

Influence of temperature on the combination spectrum of carbon tetrachloride in the liquid and gaseous states. S. A. UCHOLIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 270—272; cf. A., 1936, 1445).—Preliminary. The Raman spectrum of CCl_4 has been investigated from 50° to 250° for the R (A., I.)

liquid and to 270° and pressures up to 25 atm. for the gas. At high temp. the intensity of second- and third-order lines is of the same order of magnitude as that of first-order lines. The effect of temp. on the intensity and breadth of first-order lines is described. O. D. S.

Raman spectra of oxonium compounds. M. WOLKENSTEIN and J. K. SYRKIN (Nature, 1937, 139, 288—289).—Comparison of the Raman spectra of Me_2O and equimol. mixtures of Me_2O and HCl shows the absence of new lines in $\text{Me}_2\text{O.HCl}$ and does not support the view that the valency of O in the oxonium mol. is increased. The linking between the ether O and HCl is of a type intermediate between the chemical and the van der Waals forces, with a distance of the order of 1.3 Å. between O and H. There is no change in the spectra of $\text{Et}_2\text{O.HCl}$ compared with those of Et_2O . At 253° abs., dissociation of $\text{Me}_2\text{O.HCl}$ is insignificant. L. S. T.

Raman spectra of ethylenic compounds of the general formula $\text{CHEt}:\text{CHR}$. Comparison with the compounds $\text{CH}_2:\text{CHR}$ and $\text{CHMe}:\text{CHR}$. (MLLE.) B. GREDY (Bull. Soc. chim., 1937, [v], 4, 415—422).—Data for the series $\text{CHEt}:\text{CHR}$ (where R = Me, Et, C_5H_{11} , CH_2OAc , CH_2OH , CH_2Br , CH_2Cl , CHO, Br, or Ph) have been determined. Comparison with published data for the series $\text{CH}_2:\text{CHR}$ and $\text{CHMe}:\text{CHR}$ shows that, if the compounds are classed by decreasing frequency of the ethylenic linking, the order of the radicals R is the same in the three series. E. S. H.

Raman effect of gaseous methyl- and dimethyl-acetylenes. G. GLOCKLER and F. T. WALL (Physical Rev., 1937, [ii], 51, 529—530).— C_2HMe at 2.75 atm. gave Raman lines 930, 2142, and 2941, and C_2Me_2 at 1 atm. gave one line 2938 cm^{-1} . Gas frequencies are compared with those for the liquids and vals. in each case are in satisfactory agreement with calculation (cf. A., 1935, 146). N. M. B.

Spectra of the di-substituted acetylenes and of the mustard oils. R. M. BADGER (J. Chem. Physics, 1937, 5, 178—180).—The observed splitting into two components of the Raman lines associated with the $\text{C}\equiv\text{C}$ frequency in acetylenes and with the $\text{C}\equiv\text{N}$ frequency in mustard oils is explained in terms of a Fermi resonance interaction between the fundamental frequency (ν) of these linkings and the overtone of a certain other vibration approx. $\frac{1}{2}$ or $\frac{1}{3}$ of ν . Possible vals. of this second frequency are considered. W. R. A.

Oscillations of the carbon chain in the benzene molecule. P. DONZELOT and J. BARRIOL (Compt. rend., 1937, 204, 581—582).—Theoretical. $\lambda\lambda$ of lines in the Raman spectra of C_6H_6 and cyclohexane are calc. A. J. E. W.

Scattered spectra of polymorphous and isomorphous crystals. M. VUKS (Acta Physicochim. U.R.S.S., 1937, 6, 11—24).—Previous work on the scattered spectra of α - (I) and β - $\text{p-C}_6\text{H}_4\text{Cl}_2$ (II) (A., 1936, 547) has been extended to the study of p - $\text{C}_6\text{H}_4\text{Br}_2$ and p - $\text{C}_6\text{H}_4\text{ClBr}$. Comparison of the spectra shows these last two to be isomorphous with (I). The differences observed between (I) and (II), and between

all the crystals and their respective liquids, are attributable to vibrations peculiar to the mol. lattice. The latter frequencies increase with lowering of temp., in conformity with the resulting changes in vol. and elasticity. Slight differences in the true Raman spectra are observed in the transition (I) \rightarrow (II). The Raman spectrum of liquid (I) or (II) is unchanged between 60° and 165°. F. L. U.

Raman effect. LXIV. cyclopentane- and cyclobutane-carboxylic acids and derivatives. K. W. F. KOHLRAUSCH and R. SKRABAL (*Monatsh.*, 1937, 70, 44—53).—Data are recorded for the acids and their Me, Et, Pr^a, Pr^b, and Bu^v esters and chlorides. J. W. S.

Raman effect. LXII. Heterocyclic six-membered rings. L. KAHOVEC and K. W. F. KOHLRAUSCH (*Z. physikal. Chem.*, 1937, B, 35, 29—41).—The Raman spectra of (CH₂)₅O, α -trioxymethylene, paraldehyde, and piperazine have been determined. R. C.

Raman effect of some oximinoketones. M. MILONE (*Atti V Congr. Naz. Chim.*, 1936, 1, 402—403).—The Raman spectra of solutions of 8 oximinoketones contain lines characteristic of the C:N, the C:C, and the C:O linkings. This confirms the existence of the tautomeric equilibrium, R·CO·CH:N·OH \rightleftharpoons OH·CR:C:N·OH. O. J. W.

Optical investigation of some Indian oils. III. Intensity of the scattered light. C. V. JOGARAO (*Proc. Indian Acad. Sci.*, 1936, 4, A, 621—624; cf. B., 1937, 152).—The intensities of the light scattered transversely by dust-free castor, olive, coconut, groundnut, and gingelly oils have been measured by means of the rotating-sector photometer. The results for olive and castor oils are in accord with the vals. calc. from the compressibility, n , and depolarisation. It is concluded that the light scattered by the oils is mol. in origin. J. W. S.

Raman spectra of crystal powders. III. Exchange reactions: NH₄Cl and D₂O. R. ANANTHAKRISHNAN (*Proc. Indian Acad. Sci.*, 1937, 5, A, 175—184).—The Raman spectra of ND₄Cl, NHD₃Cl, and NH₂D₂Cl, obtained by exchange reactions, are recorded and compared with that of NH₄Cl. After crystallisation from the D₂O-H₂O mixture remaining from the exchange reaction, SrCl₂ shows Raman frequencies not present in SrCl₂·6H₂O. J. W. S.

Excitation of Raman spectra with the aid of "optical catalysers." R. V. L. HARTLEY (*Nature*, 1937, 139, 329).—Theoretical. L. S. T.

Optics of white mists. I. Scattering of light as a function of the relation between the particle radius and wave-length. I. D. GUREVITSCH and T. I. VEITZER (*J. Phys. Chem. Russ.*, 1936, 8, 653—664).—Moist fumes of SO₃ and $\lambda\lambda$ 455, 510, and 610 m μ were used. The intensity I of the scattered light is max. when $2\pi\rho/\lambda = 2.9$ —3.1 (ρ radius of the particle, λ wave-length in the air). At a const. ρ $I \propto \lambda^n$; at $\rho = 1.8 \times 10^{-5}$ cm. n is 4.5—6.0, whilst at $\rho = 3.6 \times 10^{-5}$ cm. it is 1.4—2.2. J. J. B.

Emission of a radiation by the eggs of *DiscoGLOSSUS* during development.—See A., III, 132.

Dependence of luminescence on physical structure in zinc borate compounds. D. H. KABAKJIAN (*Physical Rev.*, 1937, [ii], 51, 365—368).—The prep. of luminescent ZnB₂O₄ compounds, mutually convertible by physical means into vitreous or cryst. form, is described, and the dependence of luminescence on physical structure is investigated. The vitreous granular change increases the luminescence many times. The compounds can be made luminescent without the addition of an activator, but the presence of the latter results in a condensation of the emission bands and an increase in their λ . N. M. B.

Visible luminescence of pure liquids under the influence of hard β -rays. P. A. TSCHERENKOV (*Compt. rend. Acad. Sci. U.R.S.S.*, 1937, 14, 101—105; cf. A., 1934, 938).—The luminescence induced in liquids by β -rays has the same characteristics as that produced by γ -rays. For a no. of liquids the intensity of luminescence is inversely \propto the d of the liquid and independent of n . O. D. S.

Angular distribution of the intensity of the luminescence excited in pure liquids by γ -rays. P. A. TSCHERENKOV (*Compt. rend. Acad. Sci. U.R.S.S.*, 1937, 14, 105—108).—The intensity of the luminescence excited in H₂O is max. at an angle of 30° to the direction of the primary beam. O. D. S.

Coherent visible radiation of fast electrons passing through matter. I. FRANK and I. TAMM (*Compt. rend. Acad. Sci. U.R.S.S.*, 1937, 14, 109—114; cf. preceding abstract).—Mathematical. A theory in agreement with the results of Tscherenkov is developed on the hypothesis that the visible luminescence is due to radiation by electrons moving uniformly with velocity $>$ the velocity of light in the medium. O. D. S.

Resolution and interpretation of the luminescent spectra of some solids at low temperatures. J. EWLES (*Proc. Leeds Phil. Soc.*, 1937, 3, 277—280).—Resolution has been effected of the broad band luminescent spectra at liquid air temp. of certain solids requiring the presence of a trace of impurity. Data and interpretations are tabulated for CaO-Bi and indicate that the luminescence is derived from an atom or ion of the parent lattice still associated with the lattice. A theory of phosphorescence based on the experimental ubiquity of the metastable levels is proposed. N. M. B.

Fluorescence of the bivalent rare earths. K. PRZIBRAM (*Nature*, 1937, 139, 329; cf. A., 1935, 282).—After exposure to Ra rays, CaSO₄ containing approx. 10^{-3} of Tm gives a brilliant red fluorescence in ultra-violet light at liquid air temp. L. S. T.

Fluorescence of fluorite. V. Fluorescence of europium dichloride and alkali halide-europium phosphors. K. PRZIBRAM (*Sitzungsber. Akad. Wiss. Wien*, 1935, [iia], 144, 141—149; *Chem. Zentr.*, 1936, i, 2898—2899).—Pure EuCl₂ shows a fluorescence band in the blue, corresponding with the blue fluorite bands, a sharp band at 6900 Å., and a diffuse red band resembling that of fluorite. The fluorite fluorescence is thus probably attributable to Eu(II). On crystallising EuCl₂ with Na halides (except NaF), the product shows the blue fluorescence

band after irradiation with Ra, or after heating, due to the reduction of Eu to a bivalent complex. 10^{-9} g. of Eu in NaCl may be detected. Afterglow and thermoluminescence phenomena are described.

J. S. A.

Excitation of coloured gelatin phosphors. P. FROLICH and Z. GYULAI (Z. Physik, 1937, 104, 549—552).—Gelatin coloured with various dyes (notably rhodulin-orange N) shows a greatly increased phosphorescence after long previous irradiation with white light. The effect reaches a sharp max. at dye concns. of the order of 10^{-3} g. of dye per g. of dry gelatin. The effect disappears on warming the gelatin to its m.p.

H. C. G.

Change of photo-voltaic effect with the time of illumination. G. ATHANASIU (Bul. Fac. Ştiinţe Cernauti, 1935, 8, 316—326; Chem. Zentr., 1936, i, 2705).—With sufficiently intense radiation in a galvanic chain such as Hg—Hg₂I₂ the voltage reaches a const. max. in several min.

H. J. E.

Metallic photo-resistance. Q. MAJORANA (Nuovo Cim., 1935, [ii], 12, 409—417; Chem. Zentr., 1936, i, 2704).

H. J. E.

Photo-electric and other optical measurements with silver, zinc, and fuchsin. H. HLÚČKA (Z. Physik, 1937, 104, 653—657).—Recent work on photo-electric effects, surface reflexion of polarised light, and other optical properties of Zn, Ag, and fuchsin is correlated and summarised.

H. C. G.

Secondary emission of an oxygen-caesium electrode. P. V. TIMOFEEV and A. I. PIATNITZKI (Physikal. Z. Sovietunion, 1936, 10, 518—530).—The dependence of the secondary emission on the thickness of the Ag₂O film in the substrate, on the nature of the supporting metal (Ag, Ni, Cu, Mo, W), and on the proportion of free Cs, was studied.

H. J. E.

Ionisation and dissociation of molecules by electron impact. W. BLEAKNEY, E. U. CONDON, and L. G. SMITH (J. Physical Chem., 1937, 41, 197—208).—The ionisation potentials recorded by the mass spectrograph (A., 1932, 788) for the positive ions produced by electron impact in CH₄ have been measured and equations representing the formation of the ions are suggested. Published data for H₂, C₂H₂, and (CN)₂ are discussed.

F. R. G.

Passage of current through thin aluminium oxide layers in discharge tubes. H. KESSEL (Z. tech. Physik, 1935, 16, 506—508; Chem. Zentr., 1936, i, 2705).—The conductivity of an Al₂O₃ layer produced electrolytically depends on the composition of the layer. Conductivity data for various films are given.

H. J. E.

Effect of CCl₄ vapour on the dielectric strength of air. M. T. RODINE and R. G. HERB (Physical Rev., 1937, [ii], 51, 508—511).—Curves for data obtained over 15—75 lb. per sq. in. air pressure are given: at 25° and 15 lb. pressure the dielectric strengths of the mixtures relative to pure air were 1.25—1.80 for 5—100% saturation with CCl₄. At higher pressures the % increase relative to pure air is < at 15 lb.

N. M. B.

[Dielectric losses at frequencies of $1-5 \times 10^8$ Hz.] L. ROHDE (Z. tech. Physik, 1935, 16, 637—639; Chem. Zentr., 1936, i, 2509—2510). Measurements are described and data for 12 media are tabulated.

H. J. E.

Effect of temperature on the dipole conductivity of alcohols. W. HACKEL (Physikal. Z., 1937, 38, 195—199).—The dipole conductivity of EtOH, PrⁿOH, and BuⁿOH was determined at 20—40°. The relationship between the relaxation time (t') determined from the transition wave-length λ , n , and the dielectric const., and the relaxation time (t) calc. from the mol. vol. and viscosity is $t' = at - b$ (a and b const.).

A. J. M.

Dipole moment of sulphur trioxide. A. SMITS, N. F. MOERMAN, and J. C. PATHUIS (Z. physikal. Chem., 1937, B, 35, 60—68).—The dipole moment of SO₃ vapour is zero, showing that the mol. has a plane configuration, and that polymerisation in the liquid and solid state is not due to dipole association.

R. C.

Dielectric constant of liquid sulphur trioxide. A. SMITS and N. F. MOERMAN (Rec. trav. chim., 1937, 56, 169—173).—The dielectric const., ϵ , of liquid SO₃ has been measured between 12° and 28° and that of the ice-like form of the solid between 12° and the triple point (16.85°). The ϵ -temp. curve is not discontinuous at the m.p., from which it is inferred that the polymerised mols. present in the liquid and the solid are (SO₃)₃, which have zero dipole moment and apparently a plane configuration.

R. C.

Dipole moments of some aliphatic aldehydes. J. R. PARTINGTON and D. I. COOMBER (Nature, 1937, 139, 510).—The moments of MeCHO, EtCHO, BuⁿCHO, and BuⁱCHO in C₆H₆ at 20° are 2.49, 2.54, 2.57, and 2.60×10^{-18} , respectively.

L. S. T.

Dipole moment and structure of pyrones. 2:6-Dimethyl- γ -pyrone, xanthone, and coumarin. M. A. G. RAU (Proc. Indian Acad. Sci., 1936, 4, A., 687—697).—The dipole moments have been determined in C₆H₆ solution and at 10°, 20°, 30°, and 40°. The vals. for 20° are 2:6-dimethyl- γ -pyrone 4.48, xanthone 2.93, and coumarin 4.51, all $\times 10^{-18}$ e.s.u. The high vals. are attributed to resonance between unexcited states of low moment and excited states of high moment, the lower val. for xanthone being due to the greater no. of unexcited parent states in the latter.

J. W. S.

Dipole moment and structure of some cyclic anhydrides: phthalic, succinic, and citraconic anhydrides. M. A. G. RAU and N. ANANTARAYANAN (Proc. Indian Acad. Sci., 1937, 5, A., 185—192).—The dipole moments at 20° of phthalic and citraconic anhydrides in C₆H₆ solution, and of succinic anhydride in dioxan solution, are 5.25, 4.27, and 4.20 (all $\times 10^{-18}$) e.s.u., respectively. The vals. are very high compared with the corresponding imides, and are interpreted as due to a strong resonance structure which reverses the normal direction of moment expected from vectorial addition.

J. W. S.

Accurate representation of the refractivity and density of distilled water as a function of tem-

perature. L. W. TILTON and J. K. TAYLOR (J. Res. Nat. Bur. Stand., 1937, 18, 205—214).—The applicability of an equation of the type $n - n_{20} = \{B(t - 20)^3 + A(t - 20)^2 + C(t - 20)\} / \{(t + D) \times 10^7\}$ to the temp. variation of n for a given λ has been statistically examined. A similar equation has been fitted to Chappuis' vals. for d for H_2O , and a revised table is given. A. J. E. W.

Refractive index of water for 8—24 cm. electromagnetic waves. T. T. GOLDSMITH, jun. (Physical Rev., 1937, [ii], 51, 245—247).— $\lambda\lambda$ were measured in air and H_2O for continuous waves produced by magnetron and positive grid oscillators. A decrease in n with increasing frequency indicates a start of the drop towards the infra-red val. N. M. B.

Refractive index of heavy ammonia and heavy hydrogen chloride in the visible. O. E. FRIVOLD, O. HASSEL, and S. RUSTAD (Physikal. Z., 1937, 38, 191—195; cf. A., 1936, 1322).— n for NH_3 and HCl , measured by an interferometer method, for $\lambda\lambda$ between 4358.3 and 6562.9 Å. are slightly $> n$ for ND_3 and DCl . A. J. M.

Geometrical properties of the carbon tetrahedron, and the exaltation of MR of certain diolefines. V. S. GUTRIIA (J. Gen. Chem. Russ., 1937, 7, 212—218).—Theoretical. R. T.

Refractive indices and dispersions of gases and vapours. Substituted methanes and ethane, cyclopropane, ethylene oxide, and benzene. K. L. RAMASWAMY (Proc. Indian Acad. Sci., 1936, 4, A, 675—686).—The refractive indices (n) of MeF , $MeCl$, $MeBr$, MeI , $EtCl$, CH_2Cl_2 , $CHCl_3$, CCl_4 , NH_3Me , cyclopropane, Me_2O , C_6H_6 , $MeOH$, $COMe_2$, $MeCN$, and Me_2O have been measured for $\lambda\lambda$ 6440, 5462, 5087, 4801, and 4360 Å., and for different pressures, the dispersions and compressibilities of the gases being calc. n has also been measured for liquid C_6H_6 , CCl_4 , $CHCl_3$, CH_2Cl_2 , $MeCN$, MeI , $MeOH$, and $COMe_2$ at 5462 and 4360 Å. Both the mol. refractivities and mol. dispersions are slightly higher for the vapours than for the corresponding liquids. The vals. of the electronic polarisation are calc. and compared with the dielectric polarisations (cf. A., 1936, 1182), the at. polarisations being calc. J. W. S.

Maxwell effect in some organic liquids. A. B. RAO (Proc. Indian Acad. Sci., 1937, 5, A, 124—127).— $C_7H_{15}OH$ and $C_8H_{17}OH$ show a Maxwell const. in accord with that calc. from the Raman-Krishnan theory, but the vals. for $C_6H_{13}CO_2H$ and $C_8H_{17}CO_2H$ are the calc. vals. This is attributed to mol. association. The val. for NH_2Ph is in accord with theory, whilst that for $PhNO_2$ is too high. J. W. S.

Magneto-optical dispersion of organic liquids in the ultra-violet region of the spectrum. X. Magneto-optical dispersion of isoamyl acetate, methyl isovalerate, and acetone. (Miss) B. P. M. WALTERS and E. J. EVANS (Phil. Mag., 1937, [vii], 23, 791—806; cf. this vol., 13).—Data for the three liquids are tabulated, and equations for n and for magneto-optical dispersion $n\delta$, where δ is Verdet's const., are deduced. N. M. B.

Kerr effect of nitrobenzene in benzene. H. FRIEDRICH (Physikal. Z., 1937, 38, 139).—The Kerr effect has been studied for $PhNO_2$ in C_6H_6 at concns. from 0 to 100 mol.%. The val. of the Kerr const. in the solution is compared with the vals. obtained for $PhNO_2$ in the vapour state, thus giving a measure of the hindrance to rotation of the mols. in the liquid. The curve of E/kT (E = energy of mols.) against mol. fraction of $PhNO_2$ is not linear. A. J. M.

Molecular symmetry of thiophen. I. G. B. BONTINO (Atti R. Accad. Lincei, 1936, [vi], 24, 288—294).—A detailed account of work already noted (this vol., 10). O. J. W.

Maximum valency of elements and atomic structure. X. Chemical linkages in complex ammoniates. B. ORMONT (Acta Physicochim. U.R.S.S., 1937, 6, 115—130; cf. this vol., 66).—The quantum characteristic of the valency electrons of the central atom and the steric factor are used as a basis for the classification of complex ammoniates. The NH_4 ion is not considered to have the form of a tetragonal pyramid. F. L. U.

Dithio-salts of copper. L. CAMBI and C. CORISELLI (Gazzetta, 1936, 66, 779—784).—The relative stability, magnetic behaviour, and structure of the Cu salts of dithiocarbamic and dithiocarboxylic acids are discussed. The prep. of the salts is described. O. J. W.

Resonance in carbamide and its derivatives. I. Diamagnetics. A. CLOW (Trans. Faraday Soc., 1937, 33, 381—388).—The diamagnetic susceptibilities of $CO(NH_2)_2$ and of 18 of its derivatives indicate that the structure changes from a resonating "zwitterion" in $CO(NH_2)_2$, through an amino-imino structure in $NH_2CO \cdot NHMe$, $NH_2CO \cdot NH \cdot CH_2OH$, $NH_2CO \cdot NHEt$, $NH_2CO \cdot NHPr$ and $NH_2CO \cdot NHPh$ to a carbamide structure in a tetra-substituted mol. A C^*N group in the mol. resonates between C^*N^+ and $C:N^-$. J. W. S.

Constitution of cyanogen halides. E. OLIVERI-MANDALA and L. IRRERA (Atti V Congr. Naz. Chim., 1936, 2, 423—426).—Since $CNBr$ and CNI react with HN_3 to give the 5-halogenotetrazoles it is probable that these cyanogen halides have the $N \equiv C-X$ structure, and not the carbylamine or tricyclic structures. $CNCl$ reacts in a different manner with HN_3 , but the product has not been identified. O. J. W.

Structures of the chlorofluoromethanes and the effect of bond type on chemical reactivity. L. O. BROCKWAY (J. Physical Chem., 1937, 41, 185—195).—Vals. of the C-F distance obtained by the electron diffraction method (A., 1935, 18) are recorded. In agreement with the greater stability observed by Henne and Midgley (A., 1936, 961), the linking is shorter in the chlorofluoromethanes than in MeF . A marked shortening for those compounds containing CF_n ($n = 2, 3$, or 4) is attributed to a 10% contribu-

tion by resonance structures such as $H-O-\overset{+}{F} \leftrightarrow H-O^+-\overset{-}{F}$.

A similar theory does not explain the bond shortening in SiF_4 and PF_3 . F. R. G.

Molecular structure and van der Waals forces. E. MACK, jun. (J. Physical Chem., 1937, 41, 221—231).—The author's theory of the structure of crystals (A., 1932, 904) is interpreted on the basis of van der Waals forces, and is used to explain the physical properties of solids. F. R. G.

Investigations of molecular structure of organic compounds. G. B. KISTIAKOWSKY (J. Physical Chem., 1937, 41, 175—183).—Methods of calculating resonance energies involve so many approximations that only qual. agreement with experimental bond energies can be expected. A comparison of heats of hydrogenation of certain unsaturated compounds, however, shows good agreement. F. R. G.

Quantum theory of valency. S. DUSHMAN and F. SEITZ (J. Physical Chem., 1937, 41, 233—248).—A review of the literature dealing with the cohesive energy of matter, from which it is concluded that electrostatic forces alone are involved. F. R. G.

Evaluation of certain integrals occurring in studies of molecular structure. C. A. COULSON (Proc. Camb. Phil. Soc., 1937, 33, 104—110; cf. Coolidge, A., 1933, 10). O. D. S.

Criterion of maximum overlapping of wave functions. C. A. COULSON (Proc. Camb. Phil. Soc., 1937, 33, 111—114).—The validity of the criterion developed by Pauling and Slater (cf. A., 1931, 1356) is discussed and is shown to be limited. O. D. S.

Low electronic states of simple heteropolar diatomic molecules. III. Hydrogen and univalent metal halides. R. S. MULLIKEN (Physical Rev., 1937, [ii], 51, 310—332; cf. this vol., 66).—Theoretical. N. M. B.

Dissociation of N_2^+ . R. K. ASUNDI and R. SAMUEL (Nature, 1937, 139, 375).—A discussion of the correlation of the ground level and the second excited level of the mol. N_2^+ , which shows that an unpaired electron weakens a chemical linking even if it is in a bonding orbital. The general identification of non-promoted with bonding and of promoted with antibonding electrons is contradicted. L. S. T.

Theory of the electronic energy levels of simple hydrides. J. R. STEIN (J. Chem. Physics, 1937, 5, 186—191).—Mathematical. A simplified form of the Heitler-London theory is applied to the energy levels of BH, CH, NH, OH, and FH. The energies of certain unobserved states are predicted. W. R. A.

Mass-spectrograph determination of nuclear binding energies. J. MATTAUCH (Naturwiss., 1937, 25, 156—158).—The use of a double-focussing mass spectrograph (A., 1934, 1086) for the direct determination of isotopic masses is described, particularly with regard to the determination of the mass difference of doublets. Twelve different doublets ($^{12}CH_3$ — ^{13}N) were investigated. The advantage of the apparatus is that no calibration of the dispersion scale by means of a pair of lines of which the mass difference has been determined by another method is necessary. A. J. M.

Stability of molecular and ionic lattices of hydrogen halides and alkali halides. T. NEUGEBAUER (Z. physikal. Chem., 1937, B, 35, 129—138).—The various components of the lattice energy of a hypothetical HCl ionic crystal have been calc. The results show that it is the polarisation energy, E , which is responsible for the H halides being diat. gases whilst the alkali halides are ionic crystals. E can be large only if the cation is a proton. If the cation is not a proton, then owing to the Fermi repulsion of the charge clouds the polarisation energy set free in mol. formation cannot overcompensate the electrostatic energy gain in the formation of an ionic lattice. Hydrides in which H is the anion crystallise in ionic lattices owing to the Fermi repulsion. R. C.

Bond moment and electronegativity. C. P. SMYTH (J. Physical Chem., 1937, 41, 209—219).—Dipole moments of non-C bonds are alone consistent with Pauling's electronegativity scale, which should be used in considering reactivity, since potential energy may arise from compensating charge shifts not measured by the bond moments. The moment of C—H is calc. by Mulliken's equation (A., 1935, 1306) as 0.3D whereas Pauling's scale requires 0.7D. F. R. G.

Electronic structure of methane. C. A. COULSON (Trans. Faraday Soc., 1937, 33, 388—398).—The method of mol. orbitals is applied to a study of the ground state and some excited levels of CH_4 . Assuming effective nuclear charges, 0.9e on each H-nucleus and 1.72e on the C-nucleus yields the correct binding energy and fair accord with the crit. potentials. J. W. S.

Free rotation of the C—C linking in ethane and butadiene. E. BARTHOLOME and J. KARWEIL (Naturwiss., 1937, 25, 172—173).—The infra-red spectrum of butadiene (I) contains an unsplit band at 520 cm^{-1} indicating that at least 90% of the mols. exist in a form which is rotation-symmetrical. This can only be the case if the two vinyl radicals can rotate freely. The hindrance to free rotation in (I) is due to the attraction of H atoms, the interaction of the more distant CH_2 not being effective. It follows that the rotation in C_4H_6 must be more restricted than in (I), about 50% of the mols. having free rotation. This agrees with the work of Eucken *et al.* (A., 1934, 20) and Bartholome *et al.* (A., 1935, 1189), but not with that of Howard (this vol., 112). A. J. M.

Intrinsic values of C—C and C—H linkings in hydrocarbons. M. BRUTZCUS (Compt. rend., 1937, 204, 490—492).—A general equation is developed for calculating the sum of the intrinsic bond energies of a hydrocarbon from the heat of combustion. Deduced vals. for the C—C and C—H linkings in aliphatic hydrocarbons are 223.5 and 167.7 kg.-cal., respectively. A. J. E. W.

Calculation of fundamental plane modes of vibration of the molecules C_2H_4 , C_2D_4 , and $C_2D_2H_2$. A. VERLEYSEN and C. MANNEBACK (Ann. Soc. Sci. Bruxelles, 1937, 57, 31—38; cf. A., 1936, 1324; this vol., 67).—Diagrams of the modes of vibration of the above mols. corresponding with the various frequencies are given. A. J. M.

Potential constants of tetrachloroethylene. J. DUCHESNE (Nature, 1937, 139, 288).—Calc. vals. of the forces linking different at. groupings in C_2Cl_4 are at variance with the ordinary chemical conception of its structure. L. S. T.

Force constants and structure. J. W. LINNETT and H. W. THOMPSON (Nature, 1937, 139, 509—510).—Structural problems, such as resonance, can be studied in certain cases from calculations of the force consts. of linkings from known vibration frequencies. Structures of C_2Cl_4 and $CNCl$ are thus discussed.

L. S. T.

Group theory and vibrations of polyatomic molecules. (Miss) J. E. ROSENTHAL and G. M. MURPHY (Rev. Mod. Physics, 1936, 8, 317—346).—Mathematical. The derivation of the no. and types of fundamental vibration frequencies of mols., and their evaluation, are discussed (cf. A., 1933, 339; 1934, 946). Selection rules for Raman and infra-red frequencies are given (cf. A., 1933, 553). J. G. A. G.

Substitution reactions of substituted benzenes. E. HUCKEL (Z. physikal. Chem., 1937, B, 35, 163—192).—Theoretical. A crit. examination of the theory previously advanced (A., 1931, 1356) and that of Wheland and Pauling (A., 1936, 14) has shown that as yet no satisfactory calculation of the perturbation of the charge distribution in aromatic mols. caused by substituents has been achieved. It is uncertain whether either theory is generally valid. The influence of the polarisability effect on substitution appears to be hypothetical. R. C.

Molecular constitution of naphthalene. G. B. BONINO (Gazzetta, 1936, 66, 827—843).—From a consideration of the data of Raman and infra-red spectra the most probable configuration of the fundamental level of $C_{10}H_8$ appears to be symmetrical of the D_{2h} type. Quantum-mechanical discussion shows that the formula of Willstätter and Waser (A., 1912, i, 17) represents not the fundamental but the first excited level of $C_{10}H_8$. O. J. W.

Exchange of energy and matter at bounding surfaces. A. EUCKEN (Naturwiss., 1937, 25, 209—218).—A review of work on transference of energy and matter at solid-gas interfaces, dealing particularly with the condensation of vapours on cooled surfaces. A. J. M.

Theory of the liquid state. H. EYRING and J. HIRSCHFELDER (J. Physical Chem., 1937, 41, 249—257).—Coeffs. of thermal expansion and compressibility calc. from the relation between the free and actual vol. of liquids are, with certain exceptions, in agreement with observed vals. F. R. G.

Theory of metallic binding. IV. P. GOMBAS (Z. Physik, 1937, 104, 592—603; cf. A., 1936, 925).—Calculations based on earlier experimental work show that for Ca, Sr, and Ba, the lattice energies and the compressibilities are $\propto 1/R$ and R^4 , respectively, where R = radius of elementary ionic sphere in the equilibrium position. Applicability to the cases of Cu, Ag, Au, Zn, Cd, and Hg is discussed. L. G. G.

Vibrations of a face-centred cubic lattice. C. STRACHAN (Phil. Mag., 1937, [vii], 23, 590—597).—Mathematical. F. J. L.

Some properties of the vibrational spectrum of a lattice. M. BLACKMAN (Proc. Camb. Phil. Soc., 1937, 33, 94—103; cf. A., 1935, 573).—Mathematical. O. D. S.

Internuclear distance in Te_2 . M. L. HUGGINS (J. Chem. Physics, 1937, 5, 201).—The internuclear distance, 2.59 Å., deduced from electron diffraction results agrees better with the val. calc. by Huggins' semi-empirical formula than with that calc. from the rotational band spectrum consts. W. R. A.

Atomic radii from parachor data and from electron-diffraction data. N. S. BAYLISS (J. Amer. Chem. Soc., 1937, 59, 444—447).—Revised at. parachor consts. have been calc. from published data. Assuming that at. parachors are a measure of at. vol. and that the vol. of the C atom is that of a sphere of radius 0.77 Å., it is found that one parachor unit = 0.210 Å.³ Bond radii for quadrivalent atoms and packing radii for univalent atoms, calc. from this relation, are in good agreement with existing data. E. S. H.

Ionisation and pressure during the explosion of solid explosives. M. SASIADEK (Z. Physik, 1937, 104, 566—579).—An apparatus is described for the simultaneous recording of pressure-time and ionisation-time curves during the explosion of black and smokeless powders and K, Cu, and Ag picrates in a closed chamber. Results indicate that the ionisation (I) is due to a chemical reaction and not to the high temp. of combustion and is related to the time (t) by $I = ct^2$ where c is const. H. C. G.

Investigation of free electrons in metals with the aid of X-rays. P. DEBYE (Physikal. Z., 1937, 38, 161—165).—A review of the theory of a method for determining the no. of conductivity electrons in a metal from observations of the variation with scattering angle of the intensity of the incoherent scattered radiation from the metal when irradiated with X-rays. A. J. M.

Scattering of X-rays at the conductivity electrons of beryllium. W. SCHARWACHTER (Physikal. Z., 1937, 38, 165—176).—The method of Debye for determining the no. of conductivity electrons in a metal (see preceding abstract) was applied to Be. Experiment indicates that the two electrons in the (2, 0) state are free. A. J. M.

Debye-Scherrer exposures of liquid helium. W. H. KEESOM and K. W. TACONIS (Physica, 1937, 4, 256; cf. this vol., 117).—Measurements with He I are corr. H. J. E.

Energy measurement of X-rays. I, II. E. CSASZAR (Math. nat. Anz. ung. Akad. Wiss., 1935, 52, 1—35; Chem. Zentr., 1936, i, 2502).—An instrument is described in which the X-rays are absorbed by a Pb-W alloy and the resulting temp. rise is measured with an Ag-Te thermoelement. H. J. E.

Variation in brightness along Kossel lines. M. VON LAUE (Ann. Physik, 1937, [v], 28, 528—532). A. J. M.

Formation of new nuclei in crystallisation. I. Dependence of the time of incubation on the deformation and heating conditions. M. O. KORNFIELD (J. Exp. Theor. Phys. U.S.S.R., 1935, 5,

556—562).—Al wires tempered at 410° were deformed by tension and allowed to recrystallise at 300°. The rate of nuclei formation in samples deformed 4.5—7.0% increased more rapidly than linearly with time and deformation. CH. ABS. (e)

Fifty years of general theory of crystal structure. W. NOWACKI (Ann. Guehard-Séverine, 1936, 12, 120—139).—A review.

Nature of ordinary ice. N. J. SELJAKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 183—186; cf. A., 1936, 1326).— β -Ice is unstable and changes to the α -modification on grinding and pressing. The units of the lattices of α - and β -ice are approx. equal: c/a 1.60 ± 0.02 , c 7.34 ± 0.04 Å., and a 4.52 ± 0.03 Å. The probable no. of mols. in unit lattice of both forms is 4. O. D. S.

Structure of some aqueous solutions of electrolytes. V. I. DANILOV (Physikal. Z. Sovietunion, 1936, 10, 673—685).—The influence of various dissolved ions (Li^+ , Na^+ , Cl^-) on the structure of H_2O is studied by means of photomicrograms from X-ray diffraction patterns. Results are discussed in the light of Bernal and Fowler's theories. L. G. G.

Crystal structure and molecular symmetry of solid hydrogen peroxide. G. NATTA and R. RIGAMONTI (Gazzetta, 1936, 66, 762—772).—X-Ray measurements at liquid-air temp. give a tetragonal structure for solid H_2O_2 , with 4 mols. per unit cell; a 4.02, c 8.02 Å., V 129 Å.³, d_{calc} 1.73; most probable space-group, D_2^1 or D_2^2 . It is probable that all the 4 atoms of the mol. are not co-planar. The existence of the compound $\text{H}_2\text{O}_2 \cdot 2\text{H}_2\text{O}$ is confirmed. No solid solutions are formed between H_2O_2 and H_2O or between H_2O_2 and $\text{H}_2\text{O}_2 \cdot 2\text{H}_2\text{O}$. O. J. W.

Structure of potassium tetroxide. V. KASATOTSKIN and V. KOTOV (J. Phys. Chem. Russ., 1936, 8, 620).—X-Ray analysis shows that KO_2 has a tetragonal side-centered lattice of the CaC_2 type; a 5.70, c 6.72 Å.; the cell contains 4 K and 8 O. Distance of closest approach of two O 1.28 Å. The structure is analogous to those of SiO_2 and BaO_2 ; the correct formula is thus KO_2 and not K_2O_4 . E. R.

Rotation of anionic polyhedra in cubic crystal lattices. III. Nitrates. C. FINBAK and O. HASSEL (Z. physikal. Chem., 1937, B, 35, 25—28; cf. A., 1936, 783).—The lattice const. of the high-temp. cubic forms of Tl, Rb, NH_4 , and Cs nitrates increase in this order. This anomalous sequence may be explained by supposing that the spatial "rotation" of the anion is due to the rotational motion being perturbed by the cations. R. C.

Relations between AlPO_4 and SiO_2 and between aluminophosphoric acids and silicic acids. V. CAGLIOTI (Atti V Congr. Naz. Chim., 1936, 1, 310—320).—X-Ray investigations show that pptd. AlPO_4 is amorphous. When heated for $\frac{1}{2}$ hr. under fused NaCl it crystallises in a pseudo-tetragonal phase, which is probably rhombic with 4 mols. per unit cell, a 7.137, c 6.845, d_{calc} = = 2.31. It is isomorphous with crystobalite, in which the Si-Si linking is equiv. to Al-P. Certain natural phosphates of Al are chemically similar to silicic acids. Wavellite

has a rhombic structure, a 9.7, b 17.4, c 7.07 Å., 4 mols. per unit cell. O. J. W.

X-Ray determination of structure of MgNi_2 . F. LAVES and H. WITTE (Metallwirts., 1935, 14, 1002; Chem. Zentr., 1936, i, 3091).—Contrary to Bachmetov's views, the space-groups D_{3h}^2 , D_{3d}^2 , or D_4^2 are possible for the MgNi_2 structure. J. S. A.

Basic salts. XVI. Constitution of solid basic salts of bivalent metals. III. Basic cobalt nitrates. W. FEITKNECHT (Helv. Chim. Acta, 1937, 20, 177—188; cf. A., 1936, 1080).—The crystal structures of the green- and rose-coloured basic Co nitrates have been determined by X-ray analysis. The former possesses a double- and the latter a single-plane lattice. E. S. H.

Position of the sillimanite-mullite problem. W. EITEL (Ber. deut. keram. Ges., 1937, 18, 2—11).—Mullite is now regarded as derived from sillimanite by regular replacement of 4 Si by 4 Al among 4 unit cells, with the corresponding adjustment of the O ions, thus producing a "defect lattice" (Strock, A., 1936, 1325). G. H. C.

Scattering of X-rays by gaseous alcohols, and limits of applicability of scattering method to [determination of structure of] light molecules. R. RAMSAUER (Z. physikal. Chem., 1937, B, 35, 139—162).—From measurements of the scattering by aliphatic alcohol vapours the val. 1.46 Å. has been obtained for the distance C—O. The results show that in Pr^nOH , Pr^oOH , Bu^oOH , and Bu^nOH there are attractive forces between the OH and Me groups, indicating that in the aliphatic C—H linking the H is negative. Pr^oOH seems to be a mixture of two rotation isomerides, whilst Bu^oOH has a ring-like deformed structure. Where the mol. contains light atoms the scattering method does not permit the determination of all the interat. distances. R. C.

Crystal structure of trioxymethylene. N. F. MOERMAN (Rec. trav. chim., 1937, 56, 161—166).—The solid consists of $(\text{CH}_2\text{O})_3$ mols., in which the C and O form a six-membered ring with an "armchair" form. The space-group is C_{3v}^2 . R. C.

Isotope effect in hydrogen and hydroxyl linkings. J. M. ROBERTSON and A. R. UBBELOHDE (Nature, 1937, 139, 504—505).—In $\text{D}_2\text{C}_2\text{O}_4 \cdot 2\text{D}_2\text{O}$, m.p. 95.9—97.5°, α 6.149, c 12.074, β 106.65°, there is a small expansion of the spacings of certain crystal planes compared with $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$, which reaches a max. near the direction of the H linking. This effect throws light on the mechanism of the H linking. L. S. T.

Structure of isatin.—See A., II, 166.

X-Ray investigation of crystals of *o*-nitrodi-phenylamine. M. PRASAD and J. SHANKER (J. Indian Chem. Soc., 1937, 13, 663—669).—The crystals belong to the orthorhombic bipyramidal class and to the space-group Q_1^{11} . It is concluded that the two rings are in planes parallel to each other and that a plane of symmetry passes through the centres of the N atoms. D. C. J.

Crystal orientation in tooth-enamel.—See A., III, 118.

Investigation of structure of rubber by electron diffraction. K. I. KRULOV (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 524—533).—Electronographs of rubber show more detail than do X-ray pictures. The elementary cell of rubber is orthorhombic with a 12.3, b 8.3, and c 8.1 Å. Chloroprene (I) rubber even when unstretched gives a point-interference diagram indicating 8 (I) nuclei per elementary cell with a 10.93 and b 8.23 and 3 amorphous rings with identity periods 2.23, 1.47, and 1.18 Å. Duprene gives a multiple electronograph. CH. ABS. (p)

Constitution of inorganic rubber. A. M. DE FICQUELMONT (Compt. rend., 1937, 204, 689—692).—"Inorg. rubber," $(\text{PNCl}_2)_n$, probably consists of a skeleton of high polymeric mols., the interstices of which contain smaller mols. ($n = 3-4$). The properties are discussed on this basis. The hard product obtained on slow heating to 500° is probably highly polymeric. A. J. E. W.

Highly polymerised compounds. CLI, CLII. Röntgenography and morphology of cellulose. I. X-Ray determination of structure of macromolecular lattice of native cellulose. II. Crystalline and ultracrystalline fibrillar structure of cellulose. E. SAUTER (Z. physikal. Chem., 1937, B, 35, 83—116, 117—128).—I. Using the conical film method (A., 1936, 782) and an improved X-ray camera 42 new layer-line reflexions have been observed with native cellulose. Mark and Meyer's model for the unit cell of cellulose cannot be reconciled with the new data. A new model, with the periods of identity a 10.8, c 11.8, b 10.4 Å, β 85°, is suggested. The cellobiose residue in the cellulose lattice has the symmetry C_1 ; the two planes of the pyranose ring do not lie parallel one above the other, but their projections on the base form a fairly large acute angle with each other.

II. In the fibre diagram of native cellulose there can be observed, under favourable conditions, not only the diagram of the crystal lattice but also a line-lattice diagram. It is inferred that lattice perturbations are particularly numerous, and that the fibre has, not a micellar structure as supposed by Mark and Meyer, but an ultracryst. fibrillar structure. This structure accounts satisfactorily for the physical properties of the fibre. R. C.

Constitution of the crystallised part of cellulose. VI. Positions of atoms in the new spatial model of cellulose. K. H. MEYER and L. MISCH (Helv. Chim. Acta, 1937, 20, 232—244).—In the model, derived from X-ray data, two cellobiose chains are represented, parallel to axis b and in opposite directions. E. S. H.

X-Ray studies of wood, lignin, and wood-cellulose. P. NILAKANTAN (Proc. Indian Acad. Sci., 1937, 5, A., 166—174).—In the annual ring of the heartwood of teak there is almost perfect micellar orientation with respect to fibre axis in the brown compact layer, but this decreases towards the least compact layer in the ring. Extraction of the wood with solvents, treatment with KOH, and chlorination change the relative orientation of the micelles, but the wood lattice persists. There is no

change of lattice when wood swells in H_2O , the phenomenon being intermicellar. Lignin shows diffuse scattering, confirming its amorphous character. J. W. S.

Diffraction of X-rays at very small angles by celluloses and rayons. G. L. CLARK and E. A. PARKER (Science, 1937, 85, 203—204).—Diagrams of the diffraction effects of native ramie, mercerised ramie dried under tension, and regenerated cellulose rayons are reproduced and discussed. L. S. T.

Electron diffraction patterns obtained from thin crystalline films. V. A. KOLPINSKI (Physikal. Z. Sovietunion, 1936, 10, 484—494).—A discussion of the effects of various degrees of orientation on the electron diffraction patterns from thin NaCl films. H. J. E.

Extra spots in electron diffraction patterns. V. A. KOLPINSKI (Physikal. Z. Sovietunion, 1936, 10, 563—564).—Bruck's data for Ag, Ni, and Au (A., 1936, 784) are accounted for by Finch and Wilman's explanation (*ibid.*, 414). H. J. E.

Structure of thin metallic films. S. RAMASWAMY (Proc. Indian Acad. Sci., 1936, 4, A, 656—660; cf. A., 1935, 288).—Films of Au and Ag, formed by evaporation in a vac., which are thin enough to scatter light give electron diffraction patterns corresponding with an amorphous structure. Thicker films, with metallic reflexion and high electrical conductivity, give patterns corresponding with a polycryst. structure. J. W. S.

Structure and electrical conductivity of thin films of indium. V. E. COSSLETT (Proc. Physical Soc., 1937, 49, 121—133).—The high resistance and negative temp. coeff. of thin films of In and other metals prepared under certain conditions are not due to the existence of an amorphous form of the metal (cf. Lovell, A., 1936, 665). An investigation of In by electron diffraction shows that the lattice of freshly deposited films corresponds in form with that of the bulk metal, but has a spacing 0.7% > by X-rays. For slowly deposited films and exposure to air the spacing increases and axial ratio decreases up to room temp.; finally a film showing a cubic In lattice with spacing 3.4% > for the bulk metal is obtained. This change is accompanied by slow oxidation, the oxide lattice being 0.6% > indicated by X-ray vals. The high resistance is probably due to sorption of residual gas, and the negative temp. coeff. to desorption and resorption. The change in lattice consts. is attributed to the action of gas within the lattice, possibly intermediate stages in oxide formation. N. M. B.

Nature of polish. G. I. FINCH (Trans. Faraday Soc., 1937, 33, 425—430).—The phenomena of surface flow and of halo electron diffraction patterns exhibited by polished metal surfaces are inconclusive in deciding whether such surfaces are amorphous or cryst. The ability of metallic polish to dissolve metal crystals, and the fact that the temp. of flow is limited by the m.p. of the metal, strongly support the view of the amorphous state of both surface flow and polish. Polishing results in flow on calcite single-crystal surfaces, the polish layer being cryst. and integral in structure with the crystal when the surface

is a cleavage plane or at a narrow angle to such plane, but affords halo patterns when the surface is steeply inclined to all cleavage planes. Heating causes gradual replacement of the halo pattern by the single-crystal pattern. This, in conjunction with the behaviour of SiC crystals (this vol., 119), suggests that the polish layer on a surface remote from a cleavage plane is amorphous, the surface flow being of vitreous or liquid-like material, whilst the cryst. structure formed on the cleavage plane is due to recrystallisation under the influence of the underlying crystal.

J. W. S.

Structure of polished metal surfaces. S. DOBINSKI (Phil. Mag., 1937, [vii], 23, 397—408).—Electron diffraction patterns show that when Al, Fe, Ni, Cu, Ag, Cd, Sn, Au, Pb, and Bi are polished in absence of air and other oxidising media, the surface and adjacent layers are amorphous, consisting of close-packed metal atoms, the distance of nearest approach being equal to that found in the cryst. structure of the metal in question. Surfaces polished in air have oxide films thicker than the usual protective oxide layer.

J. G. A. G.

Structural investigations of roughness and size of nuclei by electron interference. W. PAPS-DORF (Ann. Physik, 1937, [v], 28, 555—568).—Electron interference photographs obtained by transmission and reflexion with Ag films deposited in vac. on mica, collodion, glass, quartz, and rock-salt were investigated. For Ag on mica, transmission diagrams showed only straight lines instead of sharp interference rings. Reflexion diagrams gave interference rings increasing in width with decreasing thickness of film. The smoothness of the surfaces decreased in the order quartz, glass, mica, rock-salt, collodion. No interference max. could be obtained from the surfaces of liquid Hg, films of Ga on collodion, and freshly deposited Se films, though crystals formed in the Se films after 1 hr. Reflexion diagrams obtained with thin films of long-chain hydrocarbons on glass or metal showed in some cases, in addition to the layer line due to the single mols., a sharp "powder" diagram, attributed to small, ordered "heaps" of crystals projecting from the film.

A. J. M.

Molecular structure of silicobromoform. J. WOUTERS, M. DE HEMPTINNE, and P. CAPRON (Ann. Soc. Sci. Bruxelles, 1937, 57, 25—30).—Electron diffraction experiments with SiHBr_3 give 3.63 Å. for the Br-Br distance. The Si-Br distance is 2.19 ± 0.05 Å. The Si atoms are therefore not in the plane of the Br atoms. The SiBr_3 group is tetrahedral, the angle BrSiBr being $110 \pm 2.5^\circ$.

A. J. M.

Effect of heat-treatment on tribo-electric properties of quartz and of metals. P. A. MAINSTONE (Phil. Mag., 1937, [vii], 23, 620—628).—Changes in the tribo-electric properties of quartz and of metals, after heating, are due to modifications of the quartz surface, brought about by residual gases and vapours in the apparatus, and not, as previously stated (cf. A., 1935, 435), to change of the metal surface.

F. J. L.

Tribo-electric properties of a quartz-nickel interface between 120° and -78° . P. A. MAIN-

STONE (Phil. Mag., 1937, [vii], 23, 702—708).—The frictional charges produced on a Ni surface by a quartz rubber at 120° , 15° , and -78° in air and H. are in increasing order of magnitude at the three respective temp. at 60 and 5 cm. gas pressure. At 1 and 10^{-4} mm. the charges are irregular and unrelated to temp. Results are discussed in relation to data for amounts of gases absorbed by Ni.

N. M. B.

Sharpness of the magnetic Curie point. N. F. MOTT and H. H. POTTER (Nature, 1937, 139, 411).—A discussion.

L. S. T.

Exchange interaction in magnetic crystals. W. OPECHOWSKI (Physica, 1937, 4, 181—199).—Theoretical.

H. J. E.

Magneto-striction in degenerate electron gas. D. V. GOGATE (Phil. Mag., 1937, [vii], 23, 487—490).—Mathematical.

J. G. A. G.

Influence of elastic tension on magneto-striction. B. K. GIRENCHIN (Physikal. Z. Sovietunion, 1936, 10, 689—693).—The effect of tension on the magneto-striction and magnetisation of samples of Ni wire was investigated. The experimental results agree with theory.

A. E. M.

Magneto-resistance effect in single crystals of cadmium. C. J. MILNER (Proc. Camb. Phil. Soc., 1937, 33, 145—153).—The variation of resistance of single crystals of Cd with external magnetic field up to 26 kilogauss was measured for different orientations of the crystal axis and of the direction of the magnetic field. The "crit. field" determined from the linear portion of the curve of resistance against magnetic field was of the same order as for polycryst. Cd and appears to depend on the orientation of the crystal with respect to the current and to the magnetic field. Results do not agree with the theory of Kapitza (A., 1929, 632).

O. D. S.

Rate of spread of magnetisation. F. D. MIRO-SCHNITSCHENKO (Physikal. Z. Sovietunion, 1936, 10, 540—562).—An apparatus is described. Measurements with an alloy containing Fe 85, Ni 15% are recorded.

H. J. E.

Ideal magnetisation of a crystal of iron. S. PROCOPIU (Ann. Sci. Univ. Jassy, 1935, 20, 83—85).—The permeability of Fe has been studied in an alternating field superimposed on a const. field.

R. S. B.

Determination of ferromagnetic properties of metals in the high-frequency region. (Wire bridge method.) G. POTAPENKO and R. SANGER (Z. Physik, 1937, 104, 779—803).—A method is described for measuring permeability of small quantities of metals at frequencies from 10^8 to 10^{10} , by means of resonance curves obtained from a Lecher wire system of which the metal under examination forms one bridge.

L. G. G.

Discontinuities of magnetisation in an alternating field. Explanation of multiple frequencies appearing during "ferro-resonance." S. PROCOPIU and G. VASILIU (Compt. rend., 1937, 204, 673—674; cf. A., 1932, 327, 987).—The magnetisation effects occurring in an Fe or Ni wire carrying

a.c. have been investigated. Pronounced discontinuities occur at the max. of each half-cycle.

A. J. E. W.

Dispersion curves of the reflecting powers of natural tellurides. R. MARTIN (Compt. rend., 1937, 204, 598—599).—Previous results (A., 1933, 369) have been extended, using an improved method, and $\lambda\lambda$ between 4400 and 7200 Å. A. J. E. W.

Optical properties of thin metallic films. P. ROUARD (Ann. Physique, 1937, [xi], 7, 291—384).—Films of Au, Ag, and Pt of thickness 0—40 m μ were deposited on glass by cathodic projection in anthracene vapour, and thicknesses (d) were determined optically and gravimetrically. Reflexion factors R were studied as a function of d , in the case of $d < 10$ m μ by comparison of R for the deposited film with that of glass, and for greater vals. of d by the Fabry-Buisson apparatus. The variation of phase undergone by a luminous wave for reflexion in the transparent medium (mica or glass) was determined for different $\lambda\lambda$ in the visible region for d 0—20 m μ . For Ag or Au on glass, R has a min. val. varying with λ as d increases over 0—10 m μ ; the min. val. of R is 0.002 when λ is 5461 Å. For reflexion in air, curves for R show an inflexion, sharp for Au and less so for Ag. These changes are accompanied by colour effects. Results support the view that the properties of the metal in bulk differ from those of the film. Optical consts. corresponding with the data obtained are calc., and the relation of results to accepted formulæ and theory is examined. N. M. B.

Optical reflectivity of metals in the superconducting state. E. HIRSCHLAFF (Proc. Camb. Phil. Soc., 1937, 33, 140—144; cf. Kronig, A., 1936, 147).—The reflectivities of Pb and Ta at temp. below their respective transition points to the superconducting state are changed by <0.5% on destroying the superconductivity by a magnetic field.

O. D. S.

Lattice distance and refractive index in crystals of bismuth and antimony. E. ROSA (Nuovo Cim., 1935, [ii], 12, 448—454; Chem. Zentr., 1936, i, 2699).—The distances of the (111) planes in Bi and Sb crystals were 3.957 and 3.754 Å., respectively. μ for the Fe and Cu K-radiation was 10^{-5} — 10^{-6} .

H. J. E.

Effect of orientation on stresses in single crystals and of random orientation on strength of polycrystalline aggregates. H. L. COX and D. G. SORWITH (Proc. Physical Soc., 1937, 49, 134—151).—A method of tabulating resolved shear stresses for any type of slip system is described. Data and diagrams, as functions of orientation, are given for various planes of Al and Fe. Elastic failure of polycryst. specimens is discussed. N. M. B.

Glide in metal single crystals. E. N. DA C. ANDRADE and R. ROSCOE (Proc. Physical Soc., 1937, 49, 152—177).—A method of producing single crystals of Cd and Pb which are not affected by annealing and show great regularity of mechanical behaviour is described. Data on rate of glide, crit. shear stress, hardening and recovery, and spacing of glide planes are given and discussed. It is suggested that the mechanism of permanent hardening is mainly

a rotation of crystallites in the lamellæ. A simple recording extensometer is described. N. M. B.

Kinetics of plastic deformation of crystals. M. KORNFELD (Physikal. Z. Sovietunion, 1936, 10, 605—617).—The elongation of single crystals of Al is studied with loads varying between ~100 and 5000 g. per sq. mm. over a temp. range of 15—600°.

L. G. G.

Calculation of torsional modulus of quasi-isotropic polycrystalline aggregates from single crystal constants. W. BOAS (Helv. phys. Acta, 1935, 8, 674—681; Chem. Zentr., 1936, i, 3089).—By making allowance for the mutual interaction of crystallites, the calc. torsional moduli of aggregates of cubic and hexagonal crystals give fair agreement with experimental vals. in the case of Al, Cu, Ag, Au, α -brass, α -Fe, Mg, Zn, and Cd. J. S. A.

Dynamical method for the measurement of Young's modulus for imperfectly elastic metals, and the application of the method to nickel and some of its alloys. R. M. DAVIES and I. H. THOMAS (Phil. Mag., 1937, [vii], 23, 361—397).—There is generally a parallelism between the changes of Young's modulus and electrical resistance produced by annealing. J. G. A. G.

Elastic properties of selenium. K. H. MEYER and J. F. SIEVERS (Naturwiss., 1937, 25, 171).—Amorphous Se heated to 70° becomes elastic, behaving like plastic S. If threads of elastic Se are rapidly stretched and allowed to contract at room temp. they solidify, but the elastic properties are restored on warming to 72°. Se possesses the necessary chain-like crystal structure required in a substance which exhibits this property. A. J. M.

Influence of artificial damaging of the surface on the strength of rock-salt [crystals]. M. V. CLASSEN-NEKLUDOVA (Physikal. Z. Sovietunion, 1936, 10, 442—461).—H₂O can penetrate into a NaCl crystal and render it plastic. This property is not destroyed by washing with EtOH and drying in vac. Scratching, grinding, or polishing of the dehydrated surface restores the crystal to its initial brittle condition. H. J. E.

Influence of the increase of solidity in plastic flow on the strength of rock-salt treated with water. M. V. CLASSEN-NEKLUDOVA (Physikal. Z. Sovietunion, 1936, 10, 462—483; cf. preceding abstract).—The tensile strength of dried NaCl in the [100] and [111] directions is determined by the plastic flow resulting from the action of the H₂O. Data are recorded. H. J. E.

Photo-electric elasticity limit of photochemically coloured rock-salt crystals. M. N. PODASCHEVSKI and A. M. POLONSKI (Physikal. Z. Sovietunion, 1936, 10, 531—539).—The elastic limit of NaCl coloured by exposure to ultra-violet light was determined from the photo-electric effect. In most cases no limit was observed up to or near the breaking point. Very much lower elastic limits were observed in crystals coloured by X-rays (cf. A., 1935, 1452).

H. J. E.

Lattice theory of alkaline-earth carbonates. IV. Elasticity constants of calcite. B. Y. OKE

(Proc. Indian Acad. Sci., 1936, 4, A, 667—674; cf. A., 1936, 1185; this vol., 67).—The electrostatic parts of the elasticity consts. c_{11} , c_{22} , and c_{33}^0 are calc. Formulae are derived for the repulsive components of these consts., and applying the experimental val. for c_{11} a val. is calc. for which is in accord with experiment. J. W. S.

Wrong methods for establishing non-existence of polymorphy. A. L. T. MOESVELD (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 155—164).—The conclusion that in any particular case enantiotropy does not exist cannot be reached from absence of discontinuities in physical property-temp. curves. X-Ray analysis can prove but not disprove polymorphy, since fine powdering frequently leads to transformation. The importance of retardation of transformation is pointed out. This often leads to smoothness of graphs of physical properties, such as the electrical conductivity-temp. curve for Sn at -78° to 99° , in spite of the transition point at 13.2° .

J. W. S.

Resistometric method of determining electrothermic homogeneous effect and the influence of gaseous ions. C. BENEDICKS, C. W. BORGMANN, and P. SEDERHOLM (Ark. Mat. Astron. Fysik, 1935, A, 25, No. 9, 28 pp.; Chem. Zentr., 1936, i, 3095).—An experimental method of determining the above effect of metal ions in air at low pressures is described. In the case of Pt a pressure-dependent effect due to included gaseous ions is superimposed on the effect of pure gas-free Pt. J. S. A.

Resistance of univalent metals. E. L. PETERSON and L. W. NORDHEIM (Physical Rev., 1937, [ii], 51, 355—364).—Mathematical. An attempt at a quant. estimate of resistivity, based on the present theory of the metallic state, is reported. N. M. B.

Properties of metals at very low temperatures. L. LANDAU and I. POMERANTSCHUK (Physikal. Z. Sovietunion, 1936, 10, 649—665).—The resistance of a metal at low temp., T (abs.), is $\alpha T^2 + \beta T^5$, α and β being consts. This relation holds for Pt up to 20° abs. For the thermo-electromotive force at low temp. a relation is derived which agrees with the Thomson-Onsager equation. A. E. M.

Electrical conductivity of thin films of the alkali metals spontaneously deposited on glass surfaces. A. C. B. LOVELL (Proc. Physical Soc., 1937, 49, 89—94).—The conductivity of invisible films of thickness of the order of monat. layers, deposited in vac., was investigated as a function of deposition time and surface temp. The resistivity decreases in the order K, Rb, Cs. N. M. B.

Effect of magnetic fields on persistent currents in superconducting single crystals of tin. E. F. BURTON and K. C. MANN (Nature, 1937, 139, 325—326). L. S. T.

Superconductivity of lanthanum. K. MENDELSSOHN and J. G. DAUNT (Nature, 1937, 139, 473—474).—The transition point in zero field of La containing 1% of Fe, and traces of C, Si, Al, and Mg, lies at 4.71° abs. L. S. T.

Magnetic properties of zinc-iron alloys. M. FALLOT (Ann. Physique, 1937, [xi], 7, 420—428; cf.

A., 1936, 1328).—The alloys were prepared by fusion under pressure in an atm. of N_2 for a concn. range 0—17% Zn. The Curie point temp. fell rapidly by 6° per at.-% of added Zn. Ferromagnetic moments decreased with increasing Zn concn. Results indicate a variation of the moment of the Fe atoms due to the replacement of adjacent atoms by Zn. N. M. B.

Ferromagnetism of ammonium iron alum. N. KURTI, P. LAINE, and F. SIMON (Compt. rend., 1937, 204, 675—677; cf. A., 1936, 786).—The variation of the remanent magnetism with temp., near 0° abs., has been investigated. Hysteresis curves are given and discussed. The Curie point is at 0.03° abs. A. J. E. W.

Magnetic susceptibilities of the ammonium halides. A. DINSDALE and F. A. LONG (Proc. Leeds Phil. Soc., 1937, 3, 270—276).—Data are tabulated and plotted for measurements for NH_4Cl , NH_4Br , and NH_4I from -180° to above the transition temp. from CsCl to NaCl structure, at which the change in environment of the ions may lead to susceptibility increase. At room temp. $\chi_M \times 10^6$ for NH_4Cl , NH_4Br , and NH_4I are 36.2, 46.2, and 64.1, respectively. N. M. B.

Magneto-chemical investigations. XXV. **Molecular magnitude of hyposulphurous acid.** L. KLEMM (Z. anorg. Chem., 1937, 231, 136—137).—Na hyposulphite (95% purity) has been found to be diamagnetic. The formula $Na_2S_2O_4$ is thus confirmed. F. L. U.

Magnetic anisotropy of $Cs_2[CoCl_4]$. K. S. KRISHNAN and A. MOOKHERJI (Physical Rev., 1937, [ii], 51, 528).—The magnetic anisotropy of the crystal is $<5\%$, in agreement with the predictions of Van Vleck's theory (cf. A., 1932, 985). N. M. B.

Variable magnetic moments of cobaltous compounds. E. D. P. BARKWORTH and S. SUGDEN (Nature, 1937, 139, 374—375).—A marked difference in the magnetic moments of the violet and the blue forms of bispyridylcobaltous chloride is reported and discussed in relation to the structure of the two forms. L. S. T.

Magnetic susceptibility of metallic cerium and praseodymium. L. F. VERESCHTSCHAGIN, L. V. SCHUBNIKOV, and B. G. LASAREV (Physikal. Z. Sovietunion, 1936, 10, 618—624; cf. this vol., 122).—No dependence of χ on the field strength was found for Pr, vals. of χ being determined from 14.6° to 296° abs. The variation of $1/\chi$ with T is a straight line, contrary to Trombe's findings. The previous results for Ce are discussed and extended. J. J. F.

Magnetic properties of the rare metals. F. TROMBE (Ann. Physique, 1937, [xi], 7, 385—419).—An investigation of the variation of magnetisation with temp. and field showed that La has a very weak paramagnetism decreasing with rise of temp., and Ce is paramagnetic, with complex properties at low temp. and the apparent existence of two reversible magnetic states. Nd is paramagnetic and obeys the Weiss law from room temp. to 109° abs.; the moment is 17.8 Weiss magnetons, approximating to that of the salts, 17.9, and to the calc. val. 18.0 for Nd^{+++} . The Curie point is at 10° abs. Gd salts are strongly para-

magnetic, and obey the Weiss law. Gd containing <0.03% Fe is intensely ferromagnetic at low temp.; the Curie point is at 16°. At 0° abs. the sp. magnetisation, 253.5, is > that of Fe, 221.7; the corresponding at. moment is 35.4. Above the Curie point Gd is paramagnetic and obeys the Weiss law from 90° to 366°. The calc. moment is 39.28, approximating to that of Gd_2O_3 , 39.25, and to the calc. val. 39.26 for Gd^{+++} . Ferromagnetism has not previously been observed outside the Fe group. N. M. B.

Absorption of sound by crystals at high temperatures. A. S. KOMPANEITZ (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 267—270).—Mathematical. O. D. S.

Measurements with ultrasonics on the velocity and absorption of sound at ordinary and at low temperatures. A. VAN ITTERBEEK and P. MARIËNS (Physica, 1937, 4, 207—215).—Measurements of velocity and absorption are recorded for O_2 , N_2 , and H_2 at 90° and 289° abs. and various pressures. The velocity in O_2 was uninfluenced by a magnetic field perpendicular to the direction of propagation. The absorption was decreased. H. J. E.

Influence of temperature on the absorption of ultrasonic waves in benzene and carbon tetrachloride. P. BASHULIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 273—274; cf. A., 1936, 555).—At frequency 11,470 kHz. the coeff. of absorption α of C_6H_6 increases linearly with temp. from 18° to 80°, increasing by 50% in the range studied. α of CCl_4 rises sharply near the b.p., but after prolonged boiling of the liquid falls to a val. little > that at 20°. The rise is ascribed to the presence of gas bubbles. O. D. S.

Suspended matter in sound fields. O. BRANDT, H. FREUND, and E. HIEDEMANN (Z. Physik, 1937, 104, 511—533).—The relation between suspended particles, their size, and the motion of the surrounding medium under the influence of sound waves is discussed. High-speed photomicrography is employed to elucidate certain aspects of acoustic coagulation. H. C. G.

Latent heat of evaporation of liquid helium. (A) J. SATTERLY. (B) J. N. FRIEND (Nature, 1937, 139, 472, 472—473).—(A) Experimental data do not agree at all with the val. calc. from Friend's equation (this vol., 122).

(B) A reply. Since the equation applies to many substances, liquid He is assumed to be abnormal. L. S. T.

Physical properties of solid and liquid helium. J. SATTERLY (Rev. Mod. Physics, 1936, 8, 347—357).—A summary. J. G. A. G.

Structure, heat content, and special properties of active substances. XIV. Heat content of different crystallised modifications of zinc hydroxide. XV. Active zinc oxide and stability of zinc hydroxide. R. FRICKE and K. MEYRING (Z. anorg. Chem., 1937, 230, 357—365, 366—374).—XIV. The heat contents of 4 cryst. modifications of $Zn(OH)_2$ have similar vals.; that of a specimen of $Zn(OH)_2$, amorphous on X-ray examination is about 3 kg.-cal. higher, thus fixing a lower limit for the heat of crystallisation of amorphous $Zn(OH)_2$.

XV. The heat content of active ZnO may be 1 kg.-cal. > that of the inactive oxide, but the difference depends on the method of prep. and the nature of the original material. X-Ray examination confirms that the greater heat content is associated with lattice distortion. E. S. H.

Specific heat of cobalt chloride at high temperatures. A. N. KRESTOVNIKOV and G. A. KARETNIKOV (J. Gen. Chem. Russ., 1937, 7, 6—8).—The sp. heat of $CoCl_2$ at 0—700° is expressed by $0.1460 + 1.0698 \times 10^{-4}t + 1.069 \times 10^{-8}t^2$. R. T.

Heat capacities of molybdenite and pyrites at low temperatures. C. T. ANDERSON (J. Amer. Chem. Soc., 1937, 59, 486—487).—Heat capacities of FeS_2 and MoS_2 from about 56° to 300° abs. have been determined. The corresponding entropies are 12.7 and 15.1. E. S. H.

Heat capacities of chromium, chromic oxide, chromous chloride, and chromic chloride at low temperatures. C. T. ANDERSON (J. Amer. Chem. Soc., 1937, 59, 488—491).—Heat-capacity data are recorded for Cr (56—291° abs.), Cr_2O_3 (56—336° abs.), $CrCl_2$ (44—296° abs.), and $CrCl_3$ (54—297° abs.). The corresponding entropies are 5.68, 19.4, 27.4, and 28.2. E. S. H.

Heat capacity of carbon disulphide from 15° to 300° abs. Entropy and heat of fusion of carbon disulphide. O. L. I. BROWN and G. G. MANOV (J. Amer. Chem. Soc., 1937, 59, 500—502).—Heat-capacity data are recorded. CS_2 has m.p. 161.11° abs., heat of fusion 1049.0 g.-cal. per mol. The calc. entropy of the ideal gas at 319.35° abs. is 57.48 ± 0.5 e.u., which agrees with the val. calc. from spectroscopic data. The entropy of liquid CS_2 at 298.1° abs. is 36.10 e.u. E. S. H.

Relation between heat of vaporisation and surface tension. G. L. STAROBINETZ and V. P. ROMISCH (J. Gen. Chem. Russ., 1937, 7, 151—161).—The expression $\log L/\gamma = -286a + 146.3b + 286.6c + 588.9d + 151.5e + 26f + 3.7g + 295.1h - 140.6i$, where L = latent heat of vaporisation, γ = surface tension, a, b, c, d, e, f, g, h , and i are the no. of C atoms, H atoms, C:C and C:C linkings, halogen atoms, OH groups, etheral O atoms, CO groups, and N atoms, respectively, is shown to hold for a no. of org. compounds. The expression serves for the calculation of L for liquids and azeotropic mixtures, and of the heat of expansion of liquids. R. T.

Study of liquids. N. BARBULESCU (Bull. Soc. Stiintę Cluj, 1936, 8, 462—476).—Theoretical. Formulæ are deduced to show a no. of relationships between various physical const. of pure liquids. Vals. of the internal heat of vaporisation at the b.p., Walden's const., mol. diameters, and sp. attraction are calc. from the formulæ. Longinescu's rule (A., 1903, ii, 531) is derived theoretically, and it is shown that the sp. attraction (A) of a mol. is related to that (a) of the component atoms by the formula $A^2 = n_1a_1^2 + n_2a_2^2 + \dots$, where n_1, n_2, \dots are the no. of the respective atoms. The degree of association of a liquid is given by $\sqrt{n'}/\sqrt{n}$, where n and n' are respectively the theoretical no. of atoms and the no. calc. by Longinescu's formula. F. L. U.

Thermodynamic temperature scale below 1° abs. N. KURTI, P. LAINÉ, and F. SIMON (Compt. rend., 1937, 204, 754—756; cf. A., 1935, 1096).—Experiments on the adiabatic demagnetisation of Fe NH₄ alum are described. T^*-T , $c-T$, and $S-T$ curves are given for temp. up to 0.15° abs., T^* being a temp. on an arbitrary scale obtained by extrapolation of the Curie law. A. J. E. W.

Temperature interconversion tables (° C. ° F.) and m.p. of the chemical elements. ANON. (Nat. Bur. Stand., Misc. Publ., M 126, 1937, 4 pp.).

Numerical factor in the discontinuous law of Curie points and m.p. R. FORRER (Ann. Physique, 1937, [xi], 7, 429—458; cf. A., 1936, 928).—A study of available data on Curie points, m.p., and transformations shows that the law $T - F\sqrt{N}$ previously reported (cf. A., 1935, 1305) can be amplified by expressing $F - F_1 \pm m\tau$, where $\tau = 301^\circ$, $\tau = 14^\circ$, and m is an integer. The factors F form a series, the discontinuity of which is shown in various phenomena: the two m.p. of ICl, the ferro- and para-magnetic Curie points, and the max. and min. of m.p. and Curie points which appear in the phase diagrams of alloys. N. M. B.

Relationships between the m.p., b.p., and critical magnitudes and the number of carbon atoms in homologous series. J. H. C. MERCKEL (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 164—173).—Empirical equations have been derived connecting the m.p., b.p., crit. temp., and crit. pressures of *n*-paraffins with the length of the C-chain. J. W. S.

Density curve and rectilinear diameter of krypton. E. MATHIAS, C. A. CROMMELIN, and J. J. MEIJHUIZEN (Compt. rend., 1937, 204, 630—633).—Vals. of d for the liquid and vapour are given for 13 temp. between 125° and 209° abs. At temp. >190° abs. the diameter is slightly convex towards the temp. axis. $d_c = 0.9085$. The crit. coeff. = 3.443. A. J. E. W.

Specific volumes of heavy water and its ice at the freezing point. T. TAKEUCHI and T. INAI (Japan. J. Physics, 1936, 11, 67—68).—The difference of the sp. vol. of D₂O and its ice has been determined. The max. d of D₂O (99.2%) is at 11.4°. The velocity of ultrasonic waves of frequency 5×10^6 in D₂O was found to be 1370 and 1381 m. per sec. at 13° and 20°, respectively. A. J. M.

Vapour pressure of liquid nitrogen below one atmosphere, and of solid nitrogen β . B.p. and triple point of nitrogen. W. H. KEESOM and A. BIJL (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 235—236).—The v.p. of solid N₂ β and of liquid N₂ have been determined between 53° and 78° abs. and empirical equations representing them deduced. The calc. b.p. is 77.35° abs. The triple point pressure and temp. are 9.401 cm. and 63.15° abs., respectively. The v.p. data are in accord with calorimetric data. J. W. S.

Vapour pressures of metals. A. EUCKEN (Metallwirts., 1936, 15, 27—32, 63—68; Chem. Zentr., 1936, i, 2513—2514).—A crit. review of methods and data. H. J. E.

Internal changes in the system sulphur trioxide. II. A. SMITS and N. F. MOERMAN (Z. physikal. Chem., 1937, B, 35, 69—81; cf. A., 1936, 788).—The v.-p. curves of pure β -SO₃ and the liquid, both in internal equilibrium, have been determined. The triple point is at 31.5° and 375.5 mm. The supposed colloidal form of SO₃ (A., 1901, ii, 650) consists of molten SO₃ containing a small quantity of α -SO₃ in suspension. The heat of sublimation of β -SO₃ is -13.5 and the heat of vaporisation of the liquid -10.6 kg.-cal. per mol. By partial distillation of β -SO₃ the internal equilibrium may be disturbed and a residue of low v.p. obtained. The heat of dissolution in 83.5% H₂SO₄ of β -SO₃ depends on the temp. at which the latter has solidified. For preps. which have solidified below 26° the val. is almost equal to that of the heat of dissolution of the liquid. The system SO₃ is most conveniently regarded as pseudoquaternary. R. C.

Vapour tension of saturated and unsaturated gaseous hydrocarbons at low temperatures. R. DELAPLACE (Compt. rend., 1937, 204, 493—495).—V.p. in the range 0—150 mm. and -120° to -196° are tabulated for C₂H₆, C₃H₈, *n*- and *iso*-C₄H₁₀, C₂H₄, C₃H₆, Δ^2 - and *iso*-C₄H₈, and C₂H₂. A. J. E. W.

Measurement of Thomson effect. R. DELACRAUSAZ (Mém. Soc. Vaudoise Sci. nat., 5, 1—58; Chem. Zentr., 1936, i, 2907).—A new experimental method is described. J. S. A.

Condensation coefficients of various substances. T. ALTY (Nature, 1937, 139, 374).—The condensation coeff., i.e., the no. of gas mols. condensing on a surface per sec./total no. incident on the surface, has been determined for the vapours of I, C₁₀H₈, camphor, and BzOH at the surfaces of their respective crystals. Substances the mols. of which have a zero dipole moment have a coeff. of unity, whilst those with large dipole moments have coeffs. $\ll 1$. L. S. T.

Atomic theory of compressibility. J. A. WASASTJERNA (Soc. Sci. fenn., Comm. phys.-math., 1935, 8, No. 8, 1—15; Chem. Zentr., 1936, i, 2712).—Theoretical. H. J. E.

Viscosity of air by the rotating-cylinder method. G. KELLSTROM (Phil. Mag., 1937, [vii], 23, 313—338; cf. A., 1935, 1455).—Details are given of results already published. Additional data lead to the vals.: $\eta_{20^\circ} = (18201 \pm 27) \times 10^{-8}$, $\eta_{23^\circ} = (18349 \pm 27) \times 10^{-8}$, and $e = (4.818 \pm 0.011) \times 10^{-10}$ e.s.u. J. G. A. G.

Viscosity of vinyl acetate. D. O. WHITE and A. C. CUTHBERTSON (Canad. J. Res., 1937, 15, B, 7—12).—The viscosity of monomeric vinyl acetate at 0—60° is given by $\eta = 1.521/(90 + t)^{1.25}$. The characteristic frequency calc. from the ratio between latent heat of evaporation and heat of cohesion is 2.17×10^{12} . J. W. S.

Oiliness of liquids. III. Kinetic friction coefficients. J. SAMESHIMA and M. MIYAKE (Bull. Chem. Soc. Japan, 1937, 12, 96—103; cf. this vol., 130).—Kinetic friction coeffs. (μ_k) have been measured between polished steel surfaces moving at 19.6 cm. per sec. relative velocity. Boundary lubrication with

the following liquids was employed: *n*-paraffins C_8 — C_9 ; saturated monohydric alcohols — C_8 ; saturated *n*-monobasic acids C_6 — C_9 ; and H_2O . With the hydrocarbons a min. val. of η is given by C_7H_{16} . Alcohols and acids show an approx. linear decrease of μ_k with increasing no. of C atoms. EtOH— H_2O mixtures give a smooth curve without max. or min.

F. L. U.

Influence of a magnetic field on viscosity of liquids. M. P. VOLAROVITSCH and D. M. TOLSTOI (J. Phys. Chem. Russ., 1936, 8, 619—620).—A magnetic field of 28 kilogauss has only a slight influence on the viscosity of liquids; the max. changes observed were 3.5% (aq. $FeCl_3$) and 3.8% (aq. $CoCl_2$).

E. R.

Influence of an electric field on the viscosity of pure liquids and colloidal solutions. Y. BJÖRNSTAHL and K. O. SNELLMAN (Kolloid-Z., 1937, 78, 258—272).—Alternating fields of 25—500 cycles up to 40 kv. per cm. do not affect the viscosity (η) of C_6H_{14} , C_6H_6 , or PhMe. That of PhCl is increased, the effect decreasing with increasing frequency (n). With $PhNO_2$ η decreases at first with increasing voltage and passes through a min., the effect increasing with increasing n . The η of $PhNO_2$ dissolved in C_6H_{14} increases, whilst that of polystyrene in C_6H_6 decreases, with increase of applied potential. Metal sols in C_6H_6 show varying behaviour depending on n and on the presence or absence of protecting colloid. The results are discussed theoretically.

F. L. U.

Equation of diffusion. P. S. EPSTEIN (Proc. Nat. Acad. Sci., 1937, 23, 94—98).—Mathematical. The anomalous asymmetry of Kolmogorov's equations (Math. Ann., 1931, 104, 415) is examined in relation to other forms of the diffusion equation of physics.

N. M. B.

Theory of diffusion in fast streaming vapours. D. MACGILLAVRY (Trans. Faraday Soc., 1937, 33, 433—439).—A new diffusion chamber, designed for the concn. of H isotopes, is described, in which the gas is diffused in fast-moving Hg vapour. The theory is discussed, the proper boundary conditions are determined, and equations describing the diffusion are derived.

J. W. S.

Infra-red absorption spectra of liquid mixtures. W. GORDY (J. Amer. Chem. Soc., 1937, 59, 464—466).—In mixtures of NH_2Ph with $COMe_2$, $EtOAc$, HCO_2Et , $MeCN$, or Pr^2O , the NH vibrational band of NH_2Ph is displaced towards shorter λ and its intensity increased, but with CCl_4 — NH_2Ph mixtures the band remains fixed. Other NH_2Ph bands remain approx. fixed for all the mixtures. The CO band of $COMe_2$, $EtOAc$, and HCO_2Et in the mixtures is displaced towards longer λ and its intensity is increased. The changes indicate association of the liquids through dipole interaction.

E. S. H.

Possible formation of hydrogen bonds in liquid mixtures. W. GORDY (J. Chem. Physics, 1937, 5, 202).—A reply to the suggestion made by Buswell *et al.* (this vol., 110) that in liquid mixtures in which a H bond is formed the OH band should be shifted to longer λ .

W. R. A.

Refractometric detection in a mixed aqueous solution of magnesium and calcium chlorides of a compound of higher order, not identical with tachydrate. G. SPACU and E. POPPER (Z. physikal. Chem., 1937, B, 35, 223—235).—Above 21° the deviation of the sp. refractivity of the mixed solution from additivity is a max. when $MgCl_2$ and $CaCl_2$ are present in equimol. proportions. Below 21° there is no evidence of compound formation.

R. C.

Viscosity of binary systems. P. B. GANGULY and S. K. CHAKRABERTTY (Z. anorg. Chem., 1937, 231, 304—312).—Data for C_6H_6 solutions of menthol, $BzOH$, $MeOH$, thymol, phenetole, linalool, $C_{10}H_8$, $AcOH$, acetophenoneoxime (I), $PhNO_2$, $COMe_2$, and $CH_3Ph.OH$ are recorded. In associated systems the η of solution and solvent (η and η_1) are connected by $\log \eta/\eta_1 \cdot A^{2/3} = k_1x_2/A + k_2$, where k_1 and k_2 are consts., x_2 the mol. fraction of solute, and A the ratio of the normal to the observed f.p. lowering for the solution. For the approx. ideal solutions [e.g., $MeOH$ or (I) in C_6H_6] the data agree with $\log \frac{\eta}{\eta_1} = k_1x_2 + k_2$.

H. J. E.

Viscosity and b.p. of aqueous solutions of HCN. M. A. OPICHTINA and O. I. FROST (J. Gen. Chem. Russ., 1936, 6, 1778—1783).—The η of aq. HCN falls with increasing [HCN]. Liquidus—vapour and b.p. curves are recorded for the system.

R. T.

Dielectric constant, density, and refraction of ternary systems. S. MITLO (Kolloid. Shurn., 1936, 2, 845—854).—Vals. are recorded for the system H_2O EtOH— Et_2O . Large deviations from additivity are observed in those mixtures which readily coagulate Fe_2O_3 hydrosols.

J. J. B.

Diffusion velocity of solid metals in relation to the lattice constants and the m.p. N. F. LASCHKO and B. T. PETRENKO (J. Phys. Chem. Russ., 1936, 8, 597—599).—Recently established relations between the diffusion coeffs. of solid metals and the lattice consts. or m.p. are explained statistically. Diffusion is assumed to occur by atoms jumping from one lattice point to the next one when the vibration has reached a certain amplitude.

E. R.

X-Ray investigation of pure iron-nickel alloys. II. Thermal expansion of some further alloys. E. A. OWEN and E. L. YATES (Proc. Physical Soc., 1937, 49, 178—188; cf. this vol., 127).—The lattice parameters of Fe—Ni alloys containing 41.1, 32.2, and 24.2 wt.-% Ni, respectively, have been measured at 10 — 600° after careful heat-treatment, and curves for the variation of the coeff. of thermal expansion with temp. obtained. In the 24.2% alloy the thermal expansion of both the α and γ components was measured, and the form of the expansion curve for a rod of the alloy, which shows a contraction at $\alpha \rightarrow \gamma$ phase transformation, is thereby explained. Vals. for the lattice parameters of the pure α and γ phases at different temp. are given. The coeff. of expansion of the body-centred α phase is approx. 8.2×10^{-6} at 0° and 14.0×10^{-6} at 200° , and that of the face-centred γ and γ' phases is 17.5×10^{-6} for 0 — 630° .

N. M. B.

Lattice spacing of iron-nickel alloys. A. J. BRADLEY and A. H. JAY (Phil. Mag., 1937, [vii], 23, 545—557).—The lattice spacing of Fe-rich, body-centred cubic alloys (0—5.7 at.-% Ni) increases from 2.8605 to 2.8644 Å., then falls and remains const. at 2.8635 Å. in the two-phase region (5.7—28 at.-% Ni). The lattice spacing of the face-centred alloy (28—100 at.-% Ni) increases to a max. (3.5741—3.5878 Å.) at 38 at.-% Ni and then falls linearly to 3.5412 Å. at 79 at.-% Ni, where there is a discontinuity, and thence linearly to 3.5168 Å., the spacing for pure Ni. The composition at the discontinuity corresponds with that of permalloy. The above results were obtained from slowly cooled alloys; quenching produces (in general) higher and erratic results. F. J. L.

Hardness and electrical conductivity of the aluminium-tin system. M. I. ZAMOTORIN (Trans. Leningrad Ind. Inst., 1936, No. 4, 23—25).—Hardness and electrical conductivity measurements afford evidence of limited solubility in the solid state. At room temp. Al dissolves about 2% Sn, and Sn < 0.5% Al. A. J. K.

Solid solutions of indium and lead. N. V. AGEEV and V. A. AGEEVA (Trans. Leningrad Ind. Inst., 1936, No. 4, 26—31).—Thermal and X-ray data are used in the construction of a modified diagram. A. J. K.

Paramagnetism in the system sodium-mercury. W. FRANKE and H. KATZ (Z. anorg. Chem., 1937, 231, 63—65; cf. A., 1934, 241).—The susceptibility (χ) of Na amalgams has been measured at 20°. The at. χ of Na is const. = 15×10^{-6} between Na 21 and 90%, in which range the compounds Na_3Hg and Na_6Hg are included. It is inferred that Na is dissolved in Hg similarly to Tl in Hg or Na in liquid NH_3 , and not chiefly in the form of atoms. F. L. U.

Precipitation-hardening in the system copper-indium and its modification by nickel and cadmium. F. WEIBKE and I. PLEGER (Z. anorg. Chem., 1937, 231, 197—216; cf. A., 1935, 22).—Cu-In alloys (In 12.8 and 15.2%) quenched at 0° from 650° show pptn.-hardening. The hardness is increased fourfold by annealing at 300° for 100 hr. The accompanying changes have been studied by X-ray analysis and microscopic examination. Within certain limits Ni or Cd can be substituted for a part of the In, the solubility of which in Cu is depressed by both metals. X-Ray and thermal data are given for the systems Cu-Ni-In and Cu-Cd-In over a limited range. F. L. U.

Alloys. W. L. BRAGG (J. Soc. Arts, 1937, 85, 430—447).—A lecture.

Theory of transition of metallic mixed phases. IV. Separation of disordered mixed phases. G. BORELIUS (Ann. Physik, 1937, [v], 28, 507—519).—An expression previously derived (A., 1936, 24) for the free energy of mixed phases with disordered distribution of atoms is applied to the calculation of the zero-point energy of binary alloy systems in which both components have the same lattice structure, and can form only mixed crystals with that structure, and disordered mixed phases. The relation between com-

position and zero-point energy can be derived from the form of the limiting solubility curve and this is carried out for the system Au-Pt. The modification of the theory for systems in which the components have small mutual solubilities (e.g., Cu-Ag) is given. The free energy-composition curve for a series of alloys shows inflexions where the mixing gap occurs, indicating the instability of the single phases. The delay in breakdown of the homogeneous phase is connected with the shape of the free energy curve. The hysteresis shown by the breakdown of the homogeneous phase with falling temp. and its re-formation as the temp. rises is discussed. A. J. M.

Hysteresis between the decomposition and re-formation of a homogeneous metallic phase. C. H. JOHANSSON and O. HAGSTEN (Ann. Physik, 1937, [v], 28, 520—527).—The variation of electrical resistance of a Pt-Au alloy, containing 30 at.-% Au, with temp. and with time after suitable pre-treatment has been examined. The decomp. of the homogeneous phase takes place much more slowly than its re-formation. The velocity of decomp., which is small just below the limiting temp. (954°), increases as the temp. falls to 560°. A. J. M.

Systems with an upper critical triple point. R. V. MERTZLIN (J. Gen. Chem. Russ., 1936, 6, 1828—1840).—The system H_2O -PhOH- $\text{C}_5\text{H}_5\text{N}$ exhibits an upper triple stratification point, at 143.5° (H_2O 57, $\text{C}_5\text{H}_5\text{N}$ 18.4, PhOH 24.6%). R. T.

Two rules concerning the solubility of gases and crude data on the solubility of krypton. F. KOROSY (Trans. Faraday Soc., 1937, 33, 416—425).—The empirical formula $\log \gamma_M = A + BT_c$ (T_c = crit. temp., γ_M = gas dissolved in 1 mol. of solvent/gas concn. in gas phase) represents approx. the solubility of different gases in a given solvent. The val. of B varies little with the solvent, its variation indicating departures from Just's law. The temp. coeff. at const. pressure is positive for gases with $T_c < 180^\circ$ abs. and negative for others. It is, however, always negative for solutions in H_2O . The temp. coeff. at const. vol. is always negative. The solubility of Kr has been determined at room temp. with an accuracy of $\pm 5\%$. J. W. S.

Solubility of salts and salt mixtures in water at temperatures above 100°. I. A. BENRATH, F. GJEDEBO, B. SCHIFFERS, and H. WUNDERLICH (Z. anorg. Chem., 1937, 231, 285—297).—Solubility data between 100° and 500° have been determined directly in sealed tubes for nitrates, halides, and sulphates and for KClO_3 , KBrO_3 , KIO_3 , and KClO_4 , which are characterised by complete miscibility of solution and melt. Data are also recorded for CdCl_2 , CdBr_2 , and CdI_2 , where compound formation occurs, and for HgI_2 , PbBr_2 , PbCl_2 , PbI_2 , Ti_2SO_4 , TiCl , and TiBr , where the miscibility is partial. H. J. E.

Solubility of sodium cyanide in water. O. I. FROST (J. Gen. Chem. Russ., 1936, 6, 1910—1912).—Solubility data are recorded for the range -26.4° to 35° . The solid phases are ice and $\text{NaCN} \cdot 2\text{H}_2\text{O}$. R. T.

Silica and silicate solubilities. A. C. TRUSS (J. Ind. Hyg., 1937, 19, 138—145).—Ultrafiltered

suspensions of various materials containing SiO_2 show a true solubility of 0.05 mg. of SiO_2 per 100 c.c. of H_2O at 38° ; much higher vals., found in the literature, are due to the presence of colloidal SiO_2 . Blood serum normally contains about 1 mg. of SiO_2 per 100 c.c.; this val. is not appreciably altered by prolonged treatment with SiO_2 suspensions. F. A. A.

Sorption of mercury vapour by iodised charcoal. II. V. A. PIANKOV (J. Gen. Chem. Russ., 1937, 7, 198—201).—The effects of varying rate of flow of gas, $[\text{Hg}]$, thickness of layer of sorbent, and temp. have been studied. R. T.

Properties of activated sugar charcoal coated with various substances. I. Liberation of acid and alkali by the action of neutral salts in relation to surface charge. H. K. ACHARYA (J. Indian Chem. Soc., 1936, 13, 723—734).—Treatment of sugar charcoal, activated in air at 600° , and weakly negatively charged in H_2O , with long-chain fatty acids and aromatic acids increases the negative charge. With 0.001*M*-electrolytes the negativity decreases in the order $\text{K} > \text{Na} > \text{Li} > \text{Rb} > \text{Sr} > \text{Ba}$, due to the apparent replacement of H ions in the adsorbed layer: the p_H of the electrolyte solutions is proportionately lowered. Mercaptans, ketones, and aldehydes behave similarly. Treatment with aromatic amines alters the surface oxide, the negativity being initially decreased and then considerably increased by the action of electrolytes; this is attributed to the preferential adsorption of anions. J. S. A.

Temperature coefficient of adsorption from solutions. I. V. P. MISCHIN and A. N. KARPOV. II. V. P. MISCHIN and E. E. POLOTSCHANSKAJA (Kolloid. Shurn., 1936, 2, 305—315, 317—322).—1. In equilibrium the attraction of a solute by the adsorbent and that by the solvent counter-balance each other; when the solvent attraction, i.e., the solubility, decreases with rising temp. the adsorption must increase. In agreement with this theory the adsorption of Ca glycerophosphate and of $(\text{PrCO}_2)_2\text{Ca}$ from H_2O by charcoal rises between 0° and 75° .

II. $(\text{CHPr}_2\cdot\text{CO}_2)_2\text{Ca}$ is adsorbed more strongly at 50° and 75° than at 0° . J. J. B.

Heat of adsorption of oxygen on charcoal at low surface concentrations. M. J. MARSHALL and A. S. MACINNES (Canad. J. Res., 15, B, 75—79).—The adsorption of O_2 on activated charcoal, over a low temp. range, was measured by means of an improved ice calorimeter and charcoal bulb, the O_2 being introduced into the middle of the adsorbing mass. At zero concn., a heat of adsorption of 129 kg.-cal. per mol. of O_2 was found, falling to 72 kg.-cal. at 6.0 micromols. per g. The initial heats of adsorption obtained by this technique are $>$ those previously found, since more uniform adsorption is obtained, and heat loss was prevented. The val. of 129 kg.-cal. per mol. of O_2 is $>$ the heat of formation of CO_2 from C, and it is considered that complexes corresponding with compounds containing C and O in ratios unknown in the normal state may exist initially and give rise to high heats of adsorption at very low O_2 concns. S. G. S.

Technique of measuring adsorption of potassium by soils. I. N. ANTIPOV-KARATAIEV and T. F. ANTIPOVA-KARATAIEVA (Kolloid. Shurn., 1935, 1, 481—494).—Calculation of H_2O adsorbed by soils by measuring the negative adsorption of sugar from its aq. solutions is impossible in presence of electrolytes as sugar is adsorbed relatively more strongly than H_2O . The adsorption of KCl can be measured only by analysing the soil before and after the adsorption. Data are recorded and discussed. J. J. B.

Adsorptive properties of synthetic resins. S. S. BHATNAGAR, A. N. KAPUR, and M. L. PURI (J. Indian Chem. Soc., 1937, 13, 679—688).—Synthetic resins show considerable adsorptive powers from solution. The adsorption can be represented by the Freundlich isotherm. A variety of solvents and solutes has been used and certain qual. deductions made relative to the factors which determine the extent of adsorption. The resins are compared with C and SiO_2 . D. C. J.

Sweating of soda and potash rosin soaps and their surface tension. I. N. N. GODBOLE and P. D. SRIVASTAVA (Kolloid.-Z., 1937, 78, 348—353; cf. A., 1936, 793).—Absorption of H_2O from saturated air by rosin soaps is greatest for those containing 1% of free alkali, less for neutral soaps, and least for those with 1% of free rosin. Na soaps are more hygroscopic when made from rosin of Indian origin than from that of American. The surface tension of 0.1% solutions is lowest when free alkali is present. F. L. U.

Surface tension of *N*-chloroacetanilide-salt-water mixtures. J. W. BELTON (Trans. Faraday Soc., 1937, 33, 440—448).—The surface tension (σ) of aq. NaCl, KCl, LiCl, CaCl_2 , BaCl_2 , and MgSO_4 is lowered in presence of NPhClAc. For alkali chlorides $d\sigma \propto$ the salt concn. (c). At const. [NPhClAc] the adsorption (Γ)-c curve is nearly parallel to that for pure salt solutions, but for CaCl_2 and BaCl_2 , Γ falls more rapidly with increasing c than with the salt alone. The presence of sucrose decreases the H_2O -adsorption. The adsorption of NPhClAc at the surface of the ternary solutions is calc. and the structure of the surface layer discussed. J. W. S.

Buffer phenomena in the domain of surface tension. V. K. SEMENTSCHENKO, A. F. GRATSCHEVA, and E. A. DAVIDOVSKAJA (Kolloid. Shurn., 1935, 1, 367—383).— γ of the ternary systems H_2O - $\text{C}_5\text{H}_{11}\cdot\text{OH}$ -NaBr and $(\text{CH}_2\cdot\text{OH})_2$ - $\text{C}_5\text{H}_{11}\cdot\text{OH}$ -NaBr was measured at 15° , and that of the system H_2O -Bu $^\circ\text{OH}$ -NaBr between 0° and 80° . Many of the γ -C curves at a const. *M* (*C* = concn. of the alcohol, *M* that of NaBr) intersect at a point ("buffer point") where γ is independent of *M*. For the solution 4*N*-NaBr 0.01*N*-Bu $^\circ\text{OH}$ γ is independent of temp. J. J. B.

Interfacial tensions of mixtures of organic liquids in presence of emulsifiers. A. G. NASINI, C. ROSSI, and P. DELLA SANTA (Atti V Congr. Naz. Chim., 1936, 1, 410—422; cf. A., 1934, 1169).—Measurements have been made of the interfacial tension, σ , for mixtures of C_6H_6 - and PhMe-amyl acetate, C_6H_6 -PhMe, PhNO_2 - CCl_4 , and of C_6H_6 -

vaseline oil against H_2O and against dil. solutions of $NaOH$ and of Na lauryl sulphate. The deviations from linearity in the σ -composition curves are discussed. O. J. W.

Potentials at the interface of two liquid phases. VI. K. KAROZEWSKI (Rocz. Chem., 1937, 17, 9—10). Potentials at the interface between $iso-C_5H_{11}OH$ and $0.0001-1.0M$ -MX in aq. solution ($M = Na, K; X = Cl, Br, I, CNS$) are recorded. R. T.

Surface activity and adsorbability of amino-acids. VIII. T. Iro (J. Agric. Chem. Soc. Japan, 1937, 13, 172—176; cf. A., 1936, 677).— Pr^+CO_2Na , Bu^+CO_2Na , and Na hexoate have only a slight reducing effect on the γ of H_2O , and in each case γ is const. over a p_H range of 8 to 13. n -Amylamine and $isohexylamine$ are surface active and reduce γ to 0.98 and 0.96, respectively. n -Butyric and $isovaleric$ ions are only weakly adsorbed by C, whilst the n -hexoic ion is readily absorbed. The salts of the two amines with fatty acids are more strongly adsorbed. J. N. A.

Surface phenomena and mechanical properties of dispersed phases. B. V. ILJIN (Kolloid. Shurn., 1935, 1, 317—326).—A review (cf. A., 1935, 141). J. J. B.

Property of the surface of silver. N. KAMEYAMA and S. KIKUCHI (J. Soc. Chem. Ind. Japan, 1937, 40, 17—18B).—Consideration of free energy changes shows that a thin layer of Ag (assumed to have zero free energy) immersed in a solution of halide, cannot take part in the reaction $Ag(s) + Cl^- H_2O = AgCl(s) + OH^- + \frac{1}{2}H_2$, in the absence of O_2 , unless the activity of the $(OH)^-$ ion is $<10^{-18}$; this is contrary to experimental observations, indicating that the surface Ag atoms are much more reactive than the interior ones. R. C. M.

Leidenfrost protective vapour layer in evaporation *in vacuo*. G. SCHMID and H. SPEIDEL (Z. Electrochem., 1937, 43, 187—192).—The stability or the vapour layer, as measured by the depth of immersion of heated metal on the surface of H_2O , has been examined at low pressures and for various temp. of H_2O and metal. When the temp. are fixed, the stability increases with rise of pressure to a max. val. and then decreases. This max. val. increases with rise in H_2O temp. to a max. val. and then decreases. The greatest stability occurs when the H_2O temp. is $26-30^\circ$ and the metal temp. $80-100^\circ$. The thickness of the vapour layer is calc. from measurements of its electrical capacity. The results obtained can be expressed by the formula $d = 1.45 \times 10^7 \times \lambda(t_m - t_s)/p(t_s - t_w)$, where d is the thickness in μ , p is the pressure in mm. Hg, t_m and t_w are the temp. of the metal and H_2O , respectively, t_s is the b.p. of H_2O at p , and λ is the thermal conductivity of H_2O vapour at t_s expressed in g.-cal. per cm. sec. degree. C. R. H.

Solvent action of the bound water of soil. A. KORUKOV (Kolloid. Shurn., 1936, 2, 297—303).—Positive and negative adsorption of $Ca(NO_3)_2$ and $CaCl_2$ by chernozem has been measured. J. J. B.

Ultramicroscopical examination of mixed films. F. M. FOWKES, R. J. MYERS, and W. D. S (A., I.)

HARKINS (J. Amer. Chem. Soc., 1937, 59, 593—595).—Films consisting of a mixture of excess of paraffin oil with fatty acids exhibit oil lenses having an average diameter $1-2 \mu$. When the mixture contains >0.3 part of paraffin to 1 part of fatty acid, no lenses appear until the film is compressed to a certain crit. pressure, when lenses (diameter $<1 \mu$) appear suddenly. The variation of the crit. conditions with film composition, film pressure, and rate of compression has been determined. The appearance of the lenses does not cause a discontinuity in the pressure-area curves. E. S. H.

Molecular interaction in monolayers. I. Complexes between large molecules. II. Action of haemolytic and agglutinating agents on lipoprotein monolayers. J. H. SCHULMAN and E. K. RIDEAL (Proc. Roy. Soc., 1937, B, 122, 29—45, 46—57).—I. Consideration of the effects produced when sol. adsorbable substances are injected into the liquid underlying insol. films suggests that two distinct types of equimol. complex formation occur: (a) when the association is between the polar groups of the two species of mol., (b) when association is the result of mutual attraction between the non-polar portions ("penetration"). The stability of the complexes towards compression varies widely; in some cases it is that of either component. Experiments on the inhibition of haemolysis due to the formation of such complexes are described.

II. A mixed film of gliadin (I) + 20% of cholesterol (II) at p_H 7.2 sets to a gel under compression; on further compression it liquefies again and takes on the properties of a film of (II) with the expulsion of (I); this action is reversible. Tannic or gallic acid injected beneath a film of (I) is adsorbed, gallic acid only slowly. Na oleate injected beneath a film of (I) rapidly disperses it; injected beneath a gallic acid-treated film of (I), slow dispersion occurs. With a tannic acid-treated film, penetration, but no dispersion, takes place, probably owing to the formation of macromols. The processes of lysis, agglutination, and sensitisation of red cells are discussed in relation to these results.

F. A. A.

Influence of electrolyte content of the medium on properties of completely spread protein films. G. J. PHILIPPI (Biochem. J., 1937, 31, 513—520).—The surface occupied by protein films depends on the p_H and the electrolyte content of the medium, whilst variations of the potential drop across the films are independent of their states of compression. For areas of $1.0-2.0$ sq. m. per mg. the film pressure depends on the p_H of the medium. P. G. M.

Membrane permeability. I. Measurement of the permeability of membranes to solutes. E. J. HARTUNG, F. H. C. KELLY, and J. WERTHEIM (Trans. Faraday Soc., 1937, 33, 398—405).—An apparatus for the accurate measurement of rates of diffusion of solutes through membranes, in which a const. concn. gradient is maintained across the membrane, is described. J. W. S.

Analysis of heterocapillary systems in non-swelling bodies. A. V. DUMANSKI and M. S. OSTRIKOV (Kolloid. Shurn., 1936, 2, 727—736).—If a long vertical tube is filled with sand, and its lower end

dipped in H_2O , the % of H_2O on different levels of the tube measures the distribution of capillaries with different pore sizes. The capillary rise may be reduced by a counter-pressure. J. J. B.

Structure of semi-permeable membranes of inorganic salts. S. FORDHAM and J. T. TYSON (J.C.S., 1937, 483—487).—Semi-permeable membranes of the ferrocyanides, hydroxides, silicates, and tannates of Cu, Fe^{III} , and Pb were prepared (a) by pptn. of dil. aq. solutions of the appropriate salts and mounting on Ni or Pt gauze, (b) by an electrolytic method in collodion films, and (c) by pptn. in gelatin films. The structures of the films, as indicated by electron diffraction data, appear to be independent of the method of prep. The membranes all consist of films of gels, whether the unit is amorphous or cryst. Ferrocyanide membranes are cryst., the average size being 100—150 Å. but the ultramicroscope reveals the presence of particles 1000—4000 Å. in length, and it is suggested that the smaller crystals unite the larger particles, giving the membrane mechanical strength. The correlation between permeability and pore size obtained by microscopic methods is therefore fortuitous. Hydroxide membranes are also cryst., but the tannates are amorphous. "Silicate" membranes are found to consist largely of mixtures of gels of cryst. metallic hydroxides and amorphous silicic acid. Pb silicate, however, is cryst. The following new crystal structures are given: $\text{Cu}_2[\text{Fe}(\text{CN})_6]$, simple cubic, a 4.97 Å.; $\text{Pb}_2[\text{Fe}(\text{CN})_6]$, simple cubic, a 8.28 Å.; $\text{Pb}(\text{OH})_2$, close-packed hexagonal, a 5.26, c 14.7 Å.; $\text{Fe}(\text{OH})_3$, face-centred cubic, a 5.70 Å. The results favour an adsorption theory of permeability.

A. J. M.

Calibration of diffusion membranes and calculation of molecular volumes from diffusion coefficients. M. L. ANSON and J. H. NORTHOPE (J. Gen. Physiol., 1937, 20, 575—588).—The calibration of diffusion membranes with NaCl, KCl, and HCl is described, and it is shown that the membrane method gives correct diffusion coeffs. The mol. vols. calc. from diffusion coeffs. are > those calc. from osmotic pressure and sedimentation data. These high vals. may be due both to hydration and to the non-spherical shape of the mols. An outline is given of the nature of the information which may be obtained from diffusion measurements. E. A. H. R.

Gas models. U. P. LELY (Ned. Tijds. Natuurk., 1935, 20, 241—250; Chem. Zentr., 1936, i, 2677).—A model illustrating kinetic and osmotic phenomena is described. H. J. E.

Osmotic pressure and gas pressure. K. H. MEYER (Z. Elektrochem., 1937, 43, 148—152).—Theoretical. The osmotic pressure of N_1 mols. in an ideal mixture with N_0 mols. is shown to be equiv. to the gas pressure of N_1 mols. in a vol. containing free space equiv. to N_0 mols. C. R. H.

Apparent molecular volumes of non-electrolytes in solution. B. PESCE (Atti V Congr. Naz. Chim., 1936, 2, 439—441).—The mol. vols. of C_{10}H_8 in C_6H_6 and of $\text{CO}(\text{NH}_2)_2$ in H_2O increase linearly with c and not with \sqrt{c} (cf. A., 1935, 162). O. J. W.

Apparent molecular refraction of non-electrolytes in solution: carbamide in water. B. PESCE (Atti V Congr. Naz. Chim., 1936, 2, 441—443).—The apparent mol. refraction of $\text{CO}(\text{NH}_2)_2$ in H_2O is a linear function of the concn., as with electrolytes (cf. A., 1932, 804). It is probable that $\text{CO}(\text{NH}_2)_2$ is associated in H_2O and that the association increases with the concn. This is supported by f.-p. data.

O. J. W.

Rotatory power of alkaline solutions of sucrose. K. SMOLENSKI and W. KOZLOWSKI (Bull. Assoc. Chim. Sucr., 1936, 53, 837—850).—The lowering of the $[\alpha]_D$ of sucrose in solutions containing NaOH is quantitatively accounted for by formation of Na_1 and Na_2 sucrates (B., 1935, 1064). Assuming 3×10^{-13} and 3×10^{-14} as the dissociation consts. for the first and second stages of ionisation of sucrose, the mol. rotations (g.-mol. per litre) calc. for the sucrate' and sucrate'' ions, respectively, are 20.6° and 18.4° , compared with 22.6° for undissociated sucrose. The equilibrium is determined by the p_H of the solution. The first stage of dissociation begins at p_H 10 and the second at p_H 11.5. Below p_H 12.5 the predominant form is sucrose, between p_H 12.5 and 13.5 sucrate' (max. 60% at p_H 13), and beyond p_H 13.5 sucrate''. J. H. L.

Specific heats of aqueous sucrose solutions at 20° and 25° and the apparent molal heat capacity of non-electrolytes. F. T. GUCKER, jun., and F. D. AYRES (J. Amer. Chem. Soc., 1937, 59, 447—452).—The apparent mol. heat capacity of sucrose is not const.; it increases with concn., although less than does that of a uni-univalent strong electrolyte. It is more nearly a linear function of concn. than of concn.^{1/2}; the change with concn. decreases with rising temp. Its limiting val. at low concn. increases more rapidly with temp. than does the same property of most electrolytes. E. S. H.

Modifications in the spectra of aqueous solutions of phenylpyruvic acid as a function of p_H and time. J. BOE and (MLLE.) M. GEX (Compt. rend., 1937, 204, 770—772; cf. A., 1936, 1048).—The spectral variations are said to indicate the existence of five possible forms of the acid.

A. J. E. W.

Infra-red absorption of dilute solutions of HCl and HBr. C. E. LEBERKNIGHT and J. A. ORD (Physical Rev., 1937, [ii], 51, 430—433; cf. West, A., 1936, 545).—Solutions in C_6H_6 , PhCl, CCl_4 , and SnCl_4 show a single absorption band except in the case of SnCl_4 , which shows a double band for HCl and a single band for HBr in the position of one of the HCl bands; this is attributed to the formation of H_2SnCl_6 , the free and combined HCl giving two bands, and to the liberation of free HCl by HBr from SnCl_4 giving only the HCl band. It would seem that the dissolved mols. can be treated as damped simple harmonic oscillators, and damping consts. and force consts. are calc. The force consts. are < the vals. for the mol. in the vapour state. The ratio of the force consts. HCl/HBr in the solvents is approx. 1.32, which is the ratio of the dipole moments HCl/HBr in the vapour state. The ratio of the half-widths of the bands for the two mols. is approx. 1.32. Vals.

of the Einstein coeff. of absorption and of the coeff. in the electric moment equation are calc. N. M. B.

Apparent molecular volumes of strong electrolytes in concentrated solutions. B. PESCE (Atti V Congr. Naz. Chim., 1936, 2, 436—438; cf. A., 1935, 1066).—The apparent mol. vol. increases linearly with \sqrt{c} up to the vals. of c (mols. per litre) shown in parentheses: K_2CO_3 (2.2), $Sr(NO_3)_2$ (5), $NaNO_2$ (8.3), $KCNS$ (7.29). O. J. W.

Apparent equivalent refraction of calcium and strontium nitrates in aqueous solutions. B. PESCE (Atti V Congr. Naz. Chim., 1936, 2, 443—445; cf. A., 1932, 804).—The apparent equiv. refraction of $Ca(NO_3)_2$ and of $Sr(NO_3)_2$ decreases linearly with the concn. The data are discussed in relation to Fajans' theory. O. J. W.

Equivalent refraction of strong electrolytes in aqueous solution. B. PESCE (Atti V Congr. Naz. Chim., 1936, 2, 459—463).—The equiv. refractions of K_2CO_3 , $MnSO_4$, and $NaNO_2$ increase linearly with the concn. From the data the calc. ionic refractivities are: $\frac{1}{2}Mn^{++}$ 0.67, NO_2^- 9.28, $\frac{1}{2}CO_3^{--}$ 6.09.

O. J. W.

Viscosity of aqueous solutions of electrolytes as a function of the concentration. V. Sodium chloride. G. JONES and S. M. CHRISTIAN (J. Amer. Chem. Soc., 1937, 59, 484—486; cf. A., 1936, 678).—Vals. of d and η for aq. $NaCl$ (0.002—2*N*) have been determined at 0—25°. The concn. function for d can be expressed by the Root equation and for η by the Jones and Dole equation. E. S. H.

Study, by Quincke's method, of the magnetism of ferric chloride solutions. I. M. AUMERAS and M. MOUNIC (Bull. Soc. chim., 1937, [v], 4, 523—536).—The variation with time of the coeffs. of susceptibility of aq. $FeCl_3$ (0.125—23 g. per litre) has been determined. The coeff. decreases progressively, reaching an equilibrium state which depends on the temp. and concn. The mechanism of slow hydrolysis is discussed. E. S. H.

Apparent volumes and thermal expansions of salts in glycol and methyl alcohol. R. E. GIBSON and J. F. KINCAID (J. Amer. Chem. Soc., 1937, 59, 579—584).—Sp. vols. and expansion coeffs. at 25° have been determined for NaI , $NaBr$, KI , and $LiBr$ in glycol and for $LiBr$ and NaI in $MeOH$. Comparison of data for $LiBr$ in H_2O , glycol, and $MeOH$ indicates that $LiBr$ influences the structure of H_2O by promoting the tetrahedral arrangement of the mols. The apparent mol. expansibilities of the salts in glycol and $MeOH$ are negative and increase with the concn. of salt (unlike aq. solutions), agreeing with the predictions of the interioric attraction theory and the effective pressure hypothesis. Comparison with the behaviour of the salts in H_2O indicates that structural changes in H_2O are important factors determining the thermal expansion of aq. solutions. E. S. H.

Size of smoke particles suspended in air. O. TE-TCHAO (Compt. rend., 1937, 204, 852—854).—The val. of the particle radius, calc. from its concn. and the wt. of substance burned, is 2.59×10^{-5} cm., in agreement with vals. calc. by other methods.

A. J. E. W.

Optical scattering by colloidal suspensions and emulsions. S. R. RAO and N. MUTHUSWAMI (J. Annamalai Univ., 1937, 6, 107—120).—The scattering of light (λ 5462 Å.) by colloidal suspensions of S and As_2S_3 and by emulsions of C_6H_6 , $PhMe$, $PhNO_2$, and NH_2Ph with H_2O has been studied with the incident beam unpolarised, and vertically and horizontally polarised. Krishnan's rule (A., 1935, 1075) is valid for the solid suspensions but not for the emulsions. Evidence of asymmetry was obtained in the case of all the particles, including those of the emulsions. F. L. U.

Depolarisation of light which traverses suspensions and colloids in relation to the radius of the particles. N. CALINICENCO (Ann. Sci. Univ. Jassy, 1935, 20, 353—369).—For suspensions of $CaCO_3$ and H_3BO_3 in petrol and V_2O_5 in H_2O the angle of depolarisation is \propto the radius of the particles, the proportionality factor decreasing in the order given. The min. radius at which depolarisation can be observed is <0.001 mm. for $CaCO_3$ and H_3BO_3 , and 0.005 mm. for V_2O_5 . R. S. B.

New friction law, its experimental test, and its application to the friction of mineral dispersoids. B. DERJAGUIN and V. LAZAREV (Kolloid. Shurn., 1935, 1, 293—301).—Coulomb's law of external friction is supplemented by an adhesion term. The new formula is tested by measuring adhesion of powdered talc, quartzite, and graphite to glass, Fe, and brass plates. J. J. B.

Influence of light on the formation of different modifications of colloidal sulphur of Raffo. I. MARKEVITSCH and M. KOLOMITZEVA (Kolloid. Shurn., 1936, 2, 323—325).—The amount of colloidal S and of S which cannot be peptised by hot H_2O is less when the reaction $H_2SO_4 + Na_2S_2O_3 \rightarrow S$ is carried out in the arc light. J. J. B.

Constitution of highly purified sulphide sols. I. As_2S_3 sol. W. PAULI and A. LAUB (Kolloid.-Z., 1937, 78, 295—306).—In As_2S_3 sols purified by electrodecantation the $[H^+]$ calc. from the results of conductometric titration is $>$ that given by the conductivity, whereas the converse is true of the liquid separated from a coagulum obtained by freezing the sol. This coagulum has the composition As_2S_3 , and retains adsorbed stabilising groups from which H^+ is liberated by treatment with Ba^{++} . Both the original sol and the intermicellar liquid are shown by conductometric titration and by analysis to contain H_3AsO_4 and a salt, probably $H_2(AsO)AsO_4$, which are formed by oxidation of the S-containing stabilising complex. S is absent from the intermicellar liquid. On boiling the sols, H_2S is evolved and some cryst. As_2S_3 is pptd. The coagulating effects of electrolytes are essentially the same as with unpurified sols.

F. L. U.

Refraction of light by colloidal solutions. III. α - and β -stannic acid sols. A. S. MENON (Kolloid.-Z., 1937, 78, 272—277; cf. this vol., 182).—Light refracted by sols of α -stannic acid is almost completely polarised at right angles to the incident beam. The intensity follows Rayleigh's law. The particles are spherical and of a size corresponding with the wave-

length of the light used. Sols of β -stannic acid contain much larger non-spherical particles. The refracted light is incompletely polarised at right angles and the intensity does not follow Rayleigh's law. The observed differences are attributed to the difference in particle size. F. L. U.

Constitution and chemical-colloidal properties of the higher fatty acids. L. SZEGO and L. MALATESTA (Atti V Congr. Naz. Chim., 1936, 2, 569—577; cf., B., 1935, 159).—The surface tension and detergent power of aq. solutions of the Na salts of the following acids have been measured by methods previously described: oleic, ricinoleic, stearic and its 2-, 10-, and 12-OH-derivatives, cetylmalonic, and hexadecane- ω -dicarboxylic acids. The introduction of a second hydrophilic group into the C chain decreases the capillary properties of the soap, the decrease becoming larger with increased separation of the two active groups. The mols. containing two hydrophilic groups are oriented parallel to the surface in the case of these soap solutions. O. J. W.

Osmotic pressure of colloidal solutions. W. HALLER (Kolloid-Z., 1937, 78, 341—343; cf. A., 1931, 1230).—A formula for the osmotic pressure of lyophilic colloids is derived. "Swelling pressure" is regarded as the escaping tendency of loosely coiled thread-like mols., parts of which are in serpentine thermal agitation. F. L. U.

Sign of charge of calcium carbonate and its relations to its formation and to the composition of the equilibrium solution. V. M. GORTIKOV and I. G. OSTAPENKO (Kolloid. Shurn., 1935, 1, 303—315).—The electro-osmosis of aq. solutions through various samples of CaCO_3 has been examined. Pure CaCO_3 , CaCO_3 pptd. by an excess of Na_2CO_3 , natural calcite, and natural aragonite are positive in H_2O ; CaCO_3 pptd. by a deficient amount of Na_2CO_3 and tuff are negative in H_2O . CO_2 makes CaCO_3 more positive, Na_2SO_4 makes it more negative. J. J. B.

Colloidal solution of oxy-dimercuriammonium iodide. G. ROSSI and G. SOANDELLARI (Atti V Congr. Naz. Chim., 1936, 2, 522—527).—The compound $(\text{Hg}_2\text{O})\text{NH}_4\text{I}$, said to be formed when Nessler's reagent is added to a solution of an NH_4 salt, remains in colloidal suspension when an excess of the reagent is used, and when the concn. of the compound is $>0.103\%$. More conc. suspensions can be obtained by the addition of gelatin (cf. A., 1934, 614). O. J. W.

Colloidal systems of three liquid components. II. Benzene-water-methyl alcohol and carbon tetrachloride-water-methyl alcohol. N. SATA and Y. NIWASE (Bull. Chem. Soc. Japan, 1937, 12, 86—95).—Results similar to those obtained with C_6H_6 - H_2O -EtOH (A., 1935, 1459) are recorded for the above systems, but the range of appearance of the blue opalescence is more restricted with MeOH. The opalescence is independent of the d of either liquid layer, and apparently requires a symmetrical H_2O -insol. component (e.g., C_6H_6 or CCl_4 , but not C_6H_{12} or C_6H_{14}) for its production. F. L. U.

Stabilisation of suspensions and adsorption layers in disperse systems. XVI. Dispersy

and stabilisation of soot suspensions in hydrocarbons. P. M. CHOMIKOVSKI (Kolloid. Shurn., 1936, 2, 737—747).—The wetting of soot by PhMe and H_2O , and the dispersy of suspensions in PhMe + paraffin oil + oleic acid have been examined. J. J. B.

Stabilisation of aerohydrosol by oil-like substances. V. I. SAITSCHUK and O. G. NARSKICH (Kolloid. Shurn., 1936, 2, 841—844).— H_2O mist is stabilised by petroleum $>$ oleic acid $>$ cottonseed oil. J. J. B.

Formation of artificial mist on condensation nuclei. V. I. SAITSCHUK and O. G. NARSKICH (Kolloid. Shurn., 1936, 2, 801—806).—The stability of H_2O mist produced by chemical nuclei rises in the series $\text{N}_2\text{O} < \text{HCl} < \text{NO}_2 < \text{P}_2\text{O}_5 < \text{SO}_3$. Chemical nuclei may give rise to artificial clouds in the atm. J. J. B.

Influence of non-electrolytes on stability of sulphur sols. I. MARKEVITSCH and M. KOLESOVA (Kolloid. Shurn., 1936, 2, 327—331).—Coagulative power rises in the series $\text{Pr}^+\text{OH} < \text{EtOH} < \text{sec-BuOH} < \text{Bu}^+\text{OH} < \text{C}_5\text{H}_{11}\text{OH} < \text{MeOH} < \text{EtOH}$. J. J. B.

Surface salting out of surface-active substances by electrolytes and the stability of foams. N. F. JERMOLENKO and N. A. ABRAMTSCHUK (J. Phys. Chem. Russ., 1936, 8, 587—596).—The stability of foams produced in protein solutions in presence of varying quantities of NaCl , K_2SO_4 , FeCl_3 , and KCNS has been investigated. The increase in stability with increased concn. of the electrolyte is explained as due to the "surface salting out" effect, as assumed by Sementschenko. In KCNS solution, the stabilisation is followed by an opposite effect at higher concns. This is due to the liquefying effect of KCNS on protein gels and semi-solid surface films. E. R.

Coagulation of colloids. XV. Gold sol coagulation. S. S. JOSHI and N. H. RAO (J. Indian Chem. Soc., 1936, 13, 755—759).—Measurements of η and α during the coagulation process show that changes in η are discontinuous in the slow region, and cannot be correlated with the changes in colour. J. S. A.

Influence of ultrasonic waves on colloid solubility of metal hydroxides. II. N. SATA and S. WATANABE (Kolloid-Z., 1937, 78, 277—284; cf. A., 1935, 1320).—In $\text{Fe}(\text{OH})_3$ prepared from FeCl_3 and aq. NH_3 the NH_4^+ ions have a coagulating and the Cl^- ions a peptising action. During purification by hot H_2O appreciable quantities of NH_4^+ are washed out, whereas no Cl^- is detectable. Very highly purified $\text{Fe}(\text{OH})_3$ undergoes spontaneous peptisation owing to the absence of NH_4^+ , and when peptised in presence of HCl does not follow the solid-phase rule, but appears to undergo mol. dissolution. F. L. U.

Theory of rapid and slow coagulation. P. N. PAVLOV (Kolloid-Z., 1937, 78, 307—310).—Assuming that the particles of a sol are surrounded by liquid envelopes of approx. const. thickness, and that cohesion occurs when these envelopes come into contact, it is shown that the velocity coeff. of rapid coagulation must increase with decreasing radius (r) of the particles. This assumption receives

support from data which show that Smoluchowski's " A " (radius of sphere of attraction) shows an increasing divergence from $2r$ as r becomes smaller. For slow coagulation the proportionality factor ϵ in Smoluchowski's formula is put $= e^{-\zeta F/RT}$, where ζ is the electrokinetic potential of the partly discharged particles. The modified formula is in harmony with published data for benzopurpurin. F. L. U.

Kinetics of peptisation. II. Rate of peptisation of lyophobic ferric oxide. A. VON BUZAGH and F. HAN (Kolloid-Z., 1937, 78, 284—295; cf. A., 1928, 237).—The peptisation of anhyd. lyophobic Fe_2O_3 in H_2O and in dil. HCl has been studied at 0° , 25° , 50° , and 95° . In contrast to lyophilic $\text{Fe}(\text{OH})_3$, no autocatalytic effect is observed. The quantity of Fe_2O_3 peptised either increases parabolically with time, or passes through a max. In presence of HCl the rate is unimol., and with increasing $[\text{HCl}]$ passes through a max. Mechanical agitation exerts a coagulating effect, which results, in the case of H_2O , in the appearance of the "max." type of curve, and in the case of HCl , in a lowering of the velocity const. Rise of temp. increases both the rate of peptisation and that of mechanical coagulation. In practice there is an optimal rate of stirring. F. L. U.

Relation between peptisation of a precipitate and its electrokinetic potential. S. G. CHAUDHURY and J. SEN-GUPTA (J. Indian Chem. Soc., 1937, 13, 670—678).—The cataphoretic velocities of pptd. metallic ferrocyanides and sulphides have been studied during peptisation. The potential increases during peptisation. The sign of the charge depends on the concn. and is not always determined by that of the constituent ion present in excess at the time of pptn. D. C. J.

Coagulation and peptisation of humic acid by phosphates. I. K. K. APUSCHKIN (Kolloid. Shurn., 1935, 1, 495—506).—Humic acid extracted from peat by aq. NH_3 is pptd. by HCl , HNO_3 , H_2SO_4 , and H_3PO_4 at the same p_{H} . The coagulative power of cations is in the order $\text{Ca} > \text{Mg} > \text{K} > \text{NH}_4$. J. J. B.

Influence of adsorbed bases on the formation of structures in clay suspensions. G. V. LARIN (J. Phys. Chem. Russ., 1936, 8, 790).—Plastic clays containing various amounts of Na^+ , Mg^{++} , and Ca^{++} were prepared, and the thixotropy, viscosity, and particle size of the respective suspensions examined. Gelation tendency, anomaly of viscosity, and dispersity are max. at the same Na^+ content. Mg^{++} and Ca^{++} decrease the dispersity. J. J. B.

Structural viscosity and properties of solutions of cellulose esters. II. Influence of salt content of cellulose nitrate on viscosity of concentrated colloidal solutions. Z. A. ROGOVIN and M. SCHLACHOVER (J. Gen. Chem. Russ., 1936, 6, 1749—1756).—The sp. η of 2% Et_2O - EtOH solutions of cellulose nitrate (I) is unaffected, and that of 16% solutions is greatly increased, by $\text{Ca}(\text{OH})_2$, the increment increasing with the $\text{Ca}(\text{OH})_2$ content of the (I) and the $[\text{EtOH}]$ of the solution. The effect in other solvents rises in the order $\text{MeOH} < \text{COMe}_2 < \text{C}_5\text{H}_{11}\text{OAc}$. The val. of η falls to a min. 5—10 min. after adding HCl to 16% (I) in Et_2O - EtOH , and then

gradually rises during the following 10 days. The action of $\text{Ba}(\text{OH})_2$ is analogous to that of $\text{Ca}(\text{OH})_2$. R. T.

Solubility and swelling of cellulose and its derivatives. I. E. GUTH and S. ROGOVIN (Kolloid. Shurn., 1936, 2, 863—873).—Theoretical. J. J. B.

Electrochemical nature of cellulose solutions. (MME.) A. DOBRY (Compt. rend., 1937, 204, 861—863).—Solutions of cellulose di- and tri-nitrate and di- and tri-acetate in COMe_2 showed weak but measurable electrical conductivity. This is probably due to a feebly ionised group in the mol. A. J. E. W.

Double mobility of some non-Newtonian fluids with particular reference to cellulose nitrate sols. A. DE WAELE and G. DINNIS (Physics, 1936, 7, 426—431).—The ratio of the mobility at high shearing stresses to that at low stresses may be very great for certain "medium-" and "high- η " nitrocottons but is not necessarily \propto the " η " as usually accepted. Mixtures of high- and low- η nitrocottons may show similar η under low shear (with the falling ball) but under high shear may be very different in η . The high-stress mobility determines the solvent demand of the sol for such operations as spraying or brushing whereas the η at low stresses indicates the characteristics expected after application. D. F. T.

Osmotic pressure of gum arabic. III. Ionisation of sodium, calcium, and acid gums. H. B. OAKLEY (Trans. Faraday Soc., 1937, 33, 372—381; cf. A., 1935, 297; 1936, 1200).—The slope of the osmotic pressure-concn. curves for Na- and acid-gums increases sharply below a concn. of 0.25%. This may be explained by dissociation of the gum particle. The apparent ionisation passes through a 'min., attributable to change of activity and subsequent increase of ionisation due to the overlapping of the atmospheres of "gegenions." The osmotic activity of the H^+ ions of the acid gum is the corresponding electrochemical activity up to 6% concn. J. W. S.

Heat capacity of bound water. A. KOTUKOV (Kolloid. Shurn., 1936, 2, 293—296).—The sp. heat of dry gum arabic is 0.30 g.-cal. per g. The sp. heat of H_2O in aq. gum solutions is $<$ that of free H_2O . J. J. B.

Action of alkalis on araban.—See A., II, 179.

Susceptibility of particles of hydrophobic organic materials in hydrosols and suspensions to change of size and shape. R. DEGWITZ, G. CADENBACH, and H. LAPP (Kolloid-Z., 1937, 78, 311—324).—The size and form of particles of many cryst. org. substances insol. in H_2O are strongly influenced by foreign substances present in the H_2O . Hydrosols formed in presence of enough H_2O -miscible solvent to impart to the dispersed material an appreciable solubility usually contain anisotropic particles, and addition of such solvent to an isotropic sol converts it into an anisotropic one. A similar change can be effected by addition of colloids of the soap type, but not by proteins or gum arabic. Examples are afforded by lecithin, cholesterol (I), $\text{C}_6\text{H}_5\text{I}_3\text{OH}$, $o\text{-Hg}(\text{C}_6\text{H}_4\text{CO}_2\text{H})_2$, Sudan-blue, Sudan III (II), and

Sudan-red. (I) can be obtained as an isotropic hydrosol, or as rods, platelets, or filaments of thickness $< 1 \mu$ and up to 4 mm. long, by suitably varying the conditions, whilst (II) can be obtained as needles, the length of which may be varied at will between 5 and 30 μ by addition of suitable quantities of C_5H_5N . F. L. U.

Hydrophilic colloids. II. Hydration energy. Hydration in solutions of sucrose and sodium sulphate: M. V. TSOHAPEK, A. A. MOSGOVOR, and G. N. TRETIKOV (Kolloid. Shurn., 1935, 1, 399—416).—The net sorption (m) and heat of sorption (q) of H_2O from aq. solutions of EtOH, sucrose, and Na_2SO_4 by starch, agar, peat, chernozem, and SiO_2 gel have been measured. The results show that q increases with m in EtOH solution; in sucrose and Na_2SO_4 solutions m decreases with increasing concn., but q remains almost const. The "bound" H_2O seems to be present in two different forms.

J. J. B.

Colloid optics. I. Scattering of light by protein solutions. II. Scattering of light by silicic acid sols and gels. K. S. RAMAIAH (Proc. Indian Acad. Sci., 1937, 5, A, 128—137, 138—147).—I. The depolarisation and intensity of the light scattered by gelatin, casein, and albumin solutions have been measured simultaneously, and with unpolarised, horizontally polarised, and vertically polarised incident beams. The intensity is a max. and the depolarisation a min. at the isoelectric point. Ageing and changes of concn. at low concn. have little effect. Similarities in optical properties between proteins at the isoelectric point and binary liquid mixtures at the crit. solution temp. are pointed out. The phenomena, however, are not analogous.

II. The intensity and depolarisation of the light scattered by colloidal SiO_2 show that there is a continuous increase in micellar size during sol-gel transformation, and that this continues slowly after formation of a rigid gel. Where gel formation does not occur, micellar growth is arrested at an intermediate stage. The intensity of scattering is an index of micellar growth only in the later stages of the sol-gel transformation. Micellar size and therefore scattering intensity for alkaline sols and gels is $>$ for acid systems of the same concn. In slow-setting systems the micelles have almost complete spherical symmetry at a stage immediately prior to gel-formation, but later it decreases, due either to orientation of the micelles or to loose chain-formation. In rapid-setting systems the micelles have less symmetry, probably owing to their rapid growth.

J. W. S.

Mechanically labile and stable structure viscosity in gelatin sols. W. OSTWALD and W. W. STUART (Kolloid-Z., 1937, 78, 324—338).—Previous work on the viscosity (η) of gelatin sols is reviewed. Such sols exhibit two kinds of structure η (S.V.), one of which is labile and sensitive to mechanical treatment. For purposes of measurement with a capillary viscosimeter, the effects of labile S.V. can be eliminated by carrying out two successive series of measurements, the first beginning with the highest pressure, and the second with the lowest. The latter

series reveals permanent S.V., to which the de Waele-Ostwald formula is strictly applicable. Addition of H_2SO_4 in low concn. destroys only the labile S.V., whilst KCl at concns. $> 1.5M$ destroys both kinds. The factors responsible for both types of S.V. are discussed.

F. L. U.

Influence of hydrogen-ion concentration on properties of gelatin. J. H. C. MERCKEL (Kolloid-Z., 1937, 78, 339—341; cf. this vol., 133).—The m.p. of a 10% gelatin jelly rises with increase of from 3 to 5, and then attains a const. val., which is lowered by addition of NaCl, NaBr, NaI, and NaCNS in increasing order. The swelling of gelatin increases with change of p_H much more rapidly on the alkaline than on the acid side of the isoelectric point.

F. L. U.

Behaviour of peptides in aqueous solutions. M. FRANKEL (Biochem. J., 1937, 31, 491—499).—Refractometric and cryoscopic measurements give no evidence of association with peptides containing wholly or in part non-associating NH_2 -acids, such as *dl*-alanyl-*dl*-alanine, *dl*-alanylglycine, etc., whilst peptides which contain only associating NH_2 -acids (e.g. glycyl-*dl*-phenylalanine) are themselves associated.

P. G. M.

Mol. wt. of proteins. G. VANZETTI (Atti V Congr. Naz. Chim., 1936, 2, 578—598).—A review of methods used in determining the mol. wt. of proteins, and of the classification of proteins according to their degree of dispersion.

O. J. W.

Physical chemistry of the proteins. XIV. Amphoteric properties of haemoglobin. E. J. COHN, A. A. GREEN, and M. H. BLANCHARD (J. Amer. Chem. Soc., 1937, 59, 509—517).—E.m.f. measurements of systems containing carboxyhaemoglobin and NaOH or HCl have been made with the H_2 electrode. The calc. acid- and base-combining capacities are 148×10^{-5} and 113×10^{-5} mol. per g., respectively. With mol. wt. 66,700, haemoglobin thus has 174 dissociable groups, of which > 75 dipole pairs can exist at the isoelectric point. Approx. one half the dissociable groups are derived from the NH group of histidine, the guanidine nucleus of arginine, and the ϵ - NH_2 group of lysine. The p_H at which the free groups dissociate is discussed.

E. S. H.

Recent methods and devices for p_H measurement as aids to colloid chemistry. A. KUFERATH (Kolloid-Z., 1937, 79, 103—107).—A review.

Chemical equilibria of reactions between hydrocarbons. IX. Equilibrium coefficients of the reaction of polymerisation of isobutylene. R. K. DOBRONRAVOV and A. V. FROST (J. Gen. Chem. Russ., 1936, 6, 1796—1800).—The equilibrium coeffs. for isobutylene diisobutylene have been determined at 168—313°.

R. T.

Equilibria of reactions between hydrocarbons. X. Equilibrium between *n*-butylenes and isobutylene. E. K. SEREBRIAKOVA and A. V. FROST (J. Gen. Chem. Russ., 1937, 7, 122—130).—The equilibrium const. for the reaction $\Delta^a + \Delta^b \cdot C_4H_8 \rightleftharpoons iso-C_4H_8$, at 265—426°, in presence of fireclay- H_3PO_4 catalyst, is given by $\log K = 304/T - 0.528 + 0.020$.

The equilibrium mixture at 300° contains 50% of *iso*-C₄H₈, the content of which falls with rising temp. R. T.

Equilibrium constants of the reaction of hydration of propylene to isopropyl alcohol. E. K. REMIZ and A. V. FROST (J. Gen. Chem. Russ., 1937, 7, 65—70).—The equilibrium const. for the reaction C₃H₆ + H₂O ⇌ Pr^oOH is given by $\log K = 1890/T - 5.697$. At 100° and 760 mm. the max. yield of Pr^oOH is 9.8%. R. T.

Thermodynamics of the etherification of some alcohols. G. SEMERANO (Gazzetta, 1936, 66, 749—753).—The formula found previously (cf. A., 1936, 796) for the variation with pressure of the equilibrium const. of the reaction 2EtOH ⇌ Et₂O + H₂O is of the same type as that derived by Gillespie and Beattie (cf. A., 1930, 1508). O. J. W.

Second dissociation constant of carbonic acid. Y. KAUKO and A. K. AIROLA (Suomen Kem., 1937, 10, B, 7).—Vals. recorded are $K_2 \times 10^{11} = 3.19$ at 0°, 5.73 at 25°, and 7.35 at 38°. M. H. M. A.

Potentiometric researches on fumaric, maleic, and succinic acids. E. CATTELAÏN and G. COUCHET (Bull. Soc. chim., 1937, [v], 4, 499—502).—The dissociation consts. of the acids are: fumaric 6.2×10^{-4} , maleic 4.39×10^{-3} , succinic 5.3×10^{-5} . E. S. H.

Configuration of cyclohexane and methylcyclohexane rings. A. I. VOGEL and W. L. GERMAN (Chem. and Ind., 1937, 220).—Determination of the thermodynamic primary and secondary dissociation consts. of cyclohexane-, 3- and 4-methylcyclohexane-1 : 1-diacetic acids confirms the view that the rings are identical in configuration. J. S. A.

Normal acidity potential of thiazole-5-carboxylic acid. H. ERLÉNMEYER, A. EPPRECHT, and H. VON MEYENBURG (Helv. Chim. Acta, 1937, 20, 310—312).—Recorded vals. of normal acidity potential (ϵ_{ac}) and dissociation const. (K) are: nicotinic acid, ϵ_{ac} —279.4 mv., $K 1.58 \times 10^{-5}$; thiazole-5-carboxylic acid, ϵ_{ac} —166.4 mv., $K 1.497 \times 10^{-3}$; 4-methylthiazole-5-carboxylic acid, —207.5 mv., $K 2.72 \times 10^{-4}$. E. S. H.

Relative acid strengths in normal butyl alcohol. R. B. MASON and M. KILPATRICK (J. Amer. Chem. Soc., 1937, 59, 572—578).—The dissociation consts. of bromocresol-green, BzOH, AcOH, *o*-C₆H₄Cl·CO₂H, piperidinium ion, NEt₄⁺, *o*-toluic acid, bromophenol-blue, *m*-NO₂·C₆H₄·CO₂H, CH₂Cl·CO₂H, CN·CH₂·CO₂H, CHCl₂·CO₂H, azobenzenedimethylammonium ion, CCl₃·CO₂H, NH₃Ph⁺, benzeneazodiphenylammonium ion, and picric acid in Bu^oOH at 25° have been determined. E. S. H.

Calculation, by additivity, of the degree of hydrolysis of ferric chloride solutions, with the aid of their magnetic susceptibility coefficients. M. AUMÉRAS and M. MOUNIC (Bull. Soc. chim., 1937, [v], 4, 536—540).—On the basis of the law of additivity for aq. salt solutions a relation is derived, which permits the calculation of the degree of hydrolysis of salts from susceptibility coeffs. Results obtained for aq. FeCl₃ are in good agreement with published data derived by other methods. E. S. H.

Hydrogen-ion concentration and the formation of copper complexes. K. J. MURATA (J. Washington Acad. Sci., 1937, 27, 101—105).—The behaviour of the alkali salts of the Cu complexes in the case of glycollic, tartaric, and citric acids indicates that a stepwise dissociation of the OH groups of the acids occurs, and that two different complexes are formed which are stable over a definite p_H range. J. W. S.

p_H of aqueous cobaltamine complexes and their absorption spectra. III. Aqueous solutions of complexes containing the nitrite radical. H. SUEDA (Bull. Chem. Soc. Japan, 1937, 12, 71—82; cf. A., 1935, 579, 703).—The ultra-violet absorption of aq. solutions of 14 complex cobaltamine salts containing 1—6 NO₂ radicals has been studied at varying p_H vals. Compounds in which H₂O is attached to the central atom show a variation of absorption in the region p_H 8.5, whereas others do not. Addition of alkali does not affect the spectrum if NO₂ and H₂O are both present in the complex. F. L. U.

Two-shell ferrocyanide complex compounds. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1937, 231, 281—284; cf. this vol., 81).—Ionic wt. determinations have been derived from observations on the dialysis of 0.5M solutions of K₄[Fe(CN)₆] containing [Co en₆]⁶⁺, [Co₂ pn₆]⁶⁺, [Cr en₃]³⁺, [Cr pn₃]³⁺, and [Cr₃(C₂H₃O₂)₆(OH)₂]¹⁺ (en and pn = ethylene- and propylene-diamine, respectively). In each case two-shell complexes appear to be formed (e.g. [[Cr en₃][Fe(CN)₆]₄]¹³⁻). H. J. E.

Partial precipitation of cobalt by ammonia in excess and the formation of cobaltoammine ions. M. CHATELET (Compt. rend., 1937, 204, 764—766).—The nature of the equilibria between Co⁺⁺, NH₃, [Co(NH₃)]⁺, and [Co(NH₃)₃]⁺⁺ (cf. A., 1936, 797) is not affected by the concn. of NH₄Cl present. Suppression of pptn. of Co⁺⁺ by added NH₄Cl is not entirely due to alteration of the [H⁺]. A. J. E. W.

Behaviour of beryllium chloride and beryllium fluoride in aqueous solutions. M. PRYTZ (Z. anorg. Chem., 1937, 231, 238—248).—Measurements of the Cl⁻ activity in aq. BeCl₂ + KCl afford no evidence of complex formation by BeCl₂. Potentiometric and conductometric titrations of aq. BeF₂ and aq. BeCl₂ with aq. NaOH show the behaviour of BeF₂ to be abnormal, in that the first additions of NaOH form a sparingly sol. double salt, no hydroxide being pptd. The titration curves are described. H. J. E.

Combination of fatty acids with nitrogen bases. III. Mol. wt., surface tensions, viscosities, and conductivities in benzene of the system: piperidine-propionic acid. E. B. R. PRIDEAUX and R. N. COLEMAN (J.C.S., 1937, 462—465; cf. A., 1936, 1449; this vol., 126).—For solutions containing acid + base (25%) in C₆H₆ (75%) d_4^{25} and γ show max. at or near the composition of the salt. The d -composition curve lies slightly, and the γ -composition curve considerably, below the calc. curves. The conductivity (κ and Λ) of piperidine propionate increases initially on addition of C₆H₆, attains a max. with about 60% of salt, afterwards

diminishing rapidly and becoming of the same order as for the solvent when 75% of C_6H_6 is present. η diminishes with addition of C_6H_6 and approaches the val. for the solvent when 75% has been added. The product $\Delta\eta$ falls rapidly and continuously with increasing proportion of C_6H_6 , indicating a rapid decrease in the ionised part of the salt. In conjunction with cryoscopic data, the results show that with addition of C_6H_6 there is a progressive and finally complete formation of undissociated mols. or double ion-pairs.

J. W. S.

Liquid ammonia as a protophilic solvent.

A. I. SCHATTENSTEIN (J. Phys. Chem. Russ., 1936, 8, 613—618).—The increase in strength of weak acids by dissolution in liquid NH_3 is illustrated by reference to (a) the catalytic activity of various compounds in the ammonolysis of santonin (cf. A., 1936, 1075), showing that even glucose behaves as an acid in liquid NH_3 , and (b) the behaviour of acid-base indicators, showing the shift in the p_H at which change of colour is observed, and (c) the existence of indicators not known as such in aq. solutions.

E. R.

Determination of activity coefficients from the potentials of concentration cells with transference. III. Potassium chloride. IV. Calcium chloride. T. SHEDLOVSKY and D. A. MACINNES (J. Amer. Chem. Soc., 1937, 59, 503—506; cf. A., 1936, 1463).—Activity coeffs. of KCl (0.005—3.00M) and $CaCl_2$ (0.002—0.1M) at 25° have been determined from the e.m.f. of concn. cells with transference. For KCl ($>0.2M$) and $CaCl_2$ ($>0.03M$) the Debye-Hückel equation $-\log f_r = \alpha\sqrt{C}/(1 - \quad)$ holds. The relation $-\log f_r = [0.5056\sqrt{C}/(1 + 1.50\sqrt{C})] - 0.0365 \log C$ holds for KCl up to 3.00M and $-\log f_r = [1.7515\sqrt{C}/(1 + 2.814\sqrt{C})] - 0.147C$ for $CaCl_2$ up to 0.1M.

E. S. H.

Thermodynamics of aqueous potassium hydroxide solutions from electromotive force measurements. H. S. HARNED and M. A. COOK (J. Amer. Chem. Soc., 1937, 59, 496—500).—The activity coeff., relative partial mol. heat content, and relative partial mol. heat capacity have been calc. from e.m.f. measurements of the cell $H_2|KOH(0.1-4M)|K_2Hg|KOH(0.05M)|H_2$ at 5° intervals from 0° to 35°.

E. S. H.

Relations between the energy and entropy of dissolution and their significance. R. P. BELL (Trans. Faraday Soc., 1937, 33, 496—501).—Existing data for the solubility of gases indicate that there is a linear relation between the energy and entropy of dissolution of different solutes in the same solvent. This result is discussed with reference to the regularities found by Evans and Polanyi (A., 1936, 1204) for solutions of solids.

J. W. S.

Entropy of water from the third law of thermodynamics. Dissociation pressure and calorimetric heat of the reaction $Mg(OH)_2 = MgO + H_2O$. Heat capacities of magnesium hydroxide and oxide from 20° to 300° abs. W. F. GLAUQUE and R. C. ARCHIBALD (J. Amer. Chem. Soc., 1937, 59, 561—569).—The heat capacity of MgO prepared by decomp. of $Mg(OH)_2$ at 300—350° is $>$ that of MgO which has been fused. The dissociation pressure

of $Mg(OH)_2-MgO$ has been determined at 463.1° and 485.0° abs. The heat of dissolution of 1 mol. of $Mg(OH)_2$ in 10,500 c.c. of $M-HCl$ is 26,763 g.-cal. at 25°; that of 1 mol. of MgO in 10,500 c.c. of $M-HCl + 1$ mol. of H_2O is 36,498 g.-cal. at 25°. The calc. heat of dissociation of 1 mol. of $Mg(OH)_2$ to give MgO and liquid H_2O is 9738 g.-cal. after correcting for the partial mol. heat content of H_2O in the solution. From the above data and the third law of thermodynamics the mol. entropy of gaseous H_2O at 485.0°, 463.1°, and 298.1° abs. is calc. as 49.11, 48.65, and 45.10 g.-cal. per degree, respectively; these vals. agree with those obtained from spectroscopic data. The free energy of dissociation of $Mg(OH)_2$ is 9297 g.-cal. per mol.

E. S. H.

Survey of the most important types of thermodynamic processes arising from changes in work capacity, $A (-U-S)$. E. LANGE (Z. Elektrochem., 1937, 43, 158—174).—Theoretical.

C. R. H.

Application of thermodynamics to "phase changes" extending over a finite temperature range. A. J. RUTGERS and S. A. WOUTHUYSEN (Physica, 1937, 4, 235—244).—Theoretical.

H. J. E.

Measurement of affinity and the expression for the maximum work. R. PRONTELLI (Gazzetta, 1936, 66, 785—787).—A criticism of a paper by Banchetti (A., 1936, 1207).

O. J. W.

Roozeboom and partial pressure curve methods of graphically representing liquid-vapour equilibria. E. JÄNECKE (Z. Elektrochem., 1937, 43, 198—200).—The principles underlying the two methods are discussed and compared. The Roozeboom method is considered to represent equilibrium conditions more easily and accurately.

C. R. H.

Binary system $FeO-Al_2O_3$. A. B. M'INTOSH, J. R. RAIT, and R. HAY (J. Roy. Tech. Coll., 1937, 4, 72—76).—Thermal and microscopic data are recorded. Evidence has been obtained for the compounds $3FeO.Al_2O_3$ (I) and $FeO.Al_2O_3$ (II). (I) is formed from (II) and FeO at 1225°.

C. R. H.

Influence of the impurities silica, alumina, and magnesia on the m.p. of calcium carbide. C. AALL (Compt. rend., 1937, 204, 779—780).—M.p. depressions are given for additions up to 1.5% MgO , 3% SiO_2 , and 5% Al_2O_3 . For MgO and Al_2O_3 the depression reaches a max. val. and then decreases, owing to formation of a fusible aluminate.

A. J. E. W.

Magneto-chemical investigations. XXIV. Thermomagnetic study of transformations in the troilite-pyrrhotine field of the iron-sulphur system. H. HARALDSEN (Z. anorg. Chem., 1937, 231, 78—96).—General agreement is found between transition temps. in the system $Fe-S$ as indicated by magnetic susceptibility measurements and those indicated by thermal analysis (cf. A., 1935, 928). The boundary of the troilite phase on the Fe side is at $FeS_{1.00}$. The transition from paramagnetic troilite mixed crystals to ferromagnetic pyrrhotine mixed crystals occurs at $FeS_{1.10}$ and between room temp. and 275°.

F. L. U.

"Dichlorotitaniumhexachlorosulphate." G. P. LUTSCHINSKI (J. Gen. Chem. Russ., 1937, 7, 207—211).—The m.p. diagram of the system $\text{TiCl}_4\text{--SO}_2\text{Cl}_2$ indicates the formation of the compound $\text{TiCl}_4\cdot 2\text{SO}_2\text{Cl}_2$, m.p. 43–75°. R. T.

Solubility studies in the systems: benzene-*p*-nitrotoluene and benzene-*o*-nitrotoluene. H. D. CROCKFORD and E. C. POWELL, jun. (J. Elisha Mitchell Sci. Soc., 1935, 51, 143—146).—Data are recorded. The eutectic temp. are -7.2° and -33.3° , respectively. CH. ABS. (e)

Thermal investigations of binary mixtures. III. Mixtures of *p*-nitroaniline with *p*-dibromobenzene, aniline, and dimethylaniline. A. I. LICHATSHEVA (J. Phys. Chem. Russ., 1936, 8, 761—766).— $p\text{-NO}_2\text{-C}_6\text{H}_4\text{-NH}_2$ (I) forms an unstable 2:1 compound with $p\text{-C}_6\text{H}_4\text{Br}_2$ and shows a eutectic at 84° and 2.3% (I). The eutectic formed with NH_2Ph is at -10° and 5.3% (I), whilst that formed with NPhMe_2 is at -1.5° and 2.1% (I). J. J. B.

Salt hydrates and deuterates. I. Dissociation pressures of certain deuterates. J. BELL (J.C.S., 1937, 459—461).—The dissociation pressures of $\text{CuSO}_4\cdot 5\text{D}_2\text{O}$, $\text{Na}_2\text{SO}_4\cdot 10\text{D}_2\text{O}$, $\text{MgSO}_4\cdot 7\text{D}_2\text{O}$, $\text{SrCl}_2\cdot 6\text{D}_2\text{O}$, $\text{CoCl}_2\cdot 6\text{D}_2\text{O}$, $\text{NiCl}_2\cdot 6\text{D}_2\text{O}$, and $\text{NaBr}\cdot 2\text{D}_2\text{O}$ have been measured at 20— 50° , and the transition points of most of these salts determined. With the exception of $\text{Na}_2\text{SO}_4\cdot 10\text{D}_2\text{O}$, all the transition points are $<$ for the corresponding hydrates. J. W. S.

Dissociation of a solid under inert gas pressure. A. J. PERKINS (J. Chem. Physics, 1937, 5, 180—185).—The mol. fraction of NH_3 in equilibrium with $\text{BaCl}_2\cdot 8\text{NH}_3$ at 32° has been measured in the presence of various inert gases under different pressures. The simple application of the Poynting relation gives in all cases too low a val. for the mol. fraction. A new equation for the chemical potential of a component of a gaseous mixture has been derived which agrees with observation. The equation applies to the vapour of a dissociating solid in the presence of other gaseous substances. W. R. A.

Ternary system: water-potassium chloride-potassium chlorate. J. FLECK (Bull. Soc. chim., 1937, [v], 4, 558—560).—Data for 0— 50° are recorded. The only solid phases are the pure components. E. S. H.

Ternary systems $\text{KClO}_3\text{--K}_2\text{SO}_4\text{--H}_2\text{O}$ and $\text{NaClO}_3\text{--Na}_2\text{SO}_4\text{--H}_2\text{O}$. J. E. RICCI and N. S. YANTICK (J. Amer. Chem. Soc., 1937, 59, 491—496).—Solubility data for the system $\text{KClO}_3\text{--K}_2\text{SO}_4\text{--H}_2\text{O}$ at 15° , 25° , and 45° are recorded. Double salts are not formed. The system $\text{NaClO}_3\text{--Na}_2\text{SO}_4\text{--H}_2\text{O}$ has been studied at 15° , 25° , 45° , and 75° . $\text{NaClO}_3\cdot 3\text{Na}_2\text{SO}_4$ is formed at 25° and above; it has a short range of stable existence, but persists in metastable equilibrium over a considerable concn. range. E. S. H.

Equilibria in the system $\text{BeCl}_2\text{--HCl--H}_2\text{O}$. B. N. LEJKINA and A. V. NOVOSELOVA (J. Gen. Chem. Russ., 1937, 7, 241—248).—The solid phase separating from aq. BeCl_2 is a solid solution of BeO in $\text{BeCl}_2\cdot 4\text{H}_2\text{O}$. Solubility data are recorded for the system $\text{BeCl}_2\text{--HCl--H}_2\text{O}$, at 0— 30° ; the solid phases are $\text{BeCl}_2\cdot 2\text{H}_2\text{O}$ and $4\text{H}_2\text{O}$. R. T.

Equilibrium diagram of the ternary system $\text{Na}_2\text{SiO}_3\text{--PbSiO}_3\text{--SiO}_2$. K. A. KRAKAV, E. J. MUCHIN, and M. S. HEINRICH (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 281—285).—The following compounds are indicated: $\text{Na}_2\text{O}\cdot 2\text{PbO}\cdot 4\text{SiO}_2$, m.p. (incongruent) 635° ; $\text{Na}_2\text{O}\cdot 3\text{PbO}\cdot 6\text{SiO}_2$, two forms with transition temp. 540° , m.p. of form stable at high temp. 717° ; $\text{Na}_2\text{O}\cdot 2\text{PbO}\cdot 3\text{SiO}_2$, m.p. 615° ; $\text{Na}_2\text{O}\cdot 3\text{PbO}\cdot 7\text{SiO}_2$, m.p. (incongruent) 725° ; $3\text{Na}_2\text{O}\cdot 3\text{PbO}\cdot 11\text{SiO}_2$, m.p. (incongruent) 645° . The equilibrium diagram is divided into nine crystallisation fields. O. D. S.

Main types of ternary phase diagrams with iron, carbon, and any third element as components. H. EGGERS (Z. anorg. Chem., 1937, 231, 34—53).—The various systems are described and illustrated by diagrams of space models. F. L. U.

System water-sodium theobromine-sodium salicylate. E. CREPAZ (Atti V Congr. Naz. Chim., 1936, 1, 352—358).—This system shows three invariant points at 20° . The compounds $2\text{C}_7\text{H}_5\text{O}_3\text{Na}\cdot \text{C}_7\text{H}_7\text{N}_3\text{O}_2\text{Na}$ and $3\text{C}_7\text{H}_5\text{O}_3\text{Na}\cdot \text{C}_7\text{H}_7\text{N}_3\text{O}_2\text{Na}\cdot 5\text{H}_2\text{O}$ exist. Diuretin is probably a mixture of the anhyd. form of the latter compound with Na theobromine. O. J. W.

Thermal analysis of organic substances. III. Application of method to ternary systems without mixed crystals. R. N. M. A. MALOTAUX and J. STRAUB (Rec. trav. chim., 1937, 56, 263—279; cf. B., 1934, 354).—The m.-p. diagram of the system $(\text{CH}_2\text{Ph})_2\text{--COPh}_2\text{--}p\text{-C}_6\text{H}_4\text{Me}\cdot \text{NO}_2$ has been determined. No solid solutions or compounds are formed. R. C.

Equilibrium $[\text{PbCl}_2 + \text{Sn} \rightleftharpoons \text{SnCl}_2 + \text{Pb}]$ in melts. W. JANDER and H. STRIEBICH (Z. Elektrochem., 1937, 43, 193—197).—Previous data are criticised. The equilibrium has been re-examined at 550° in an improved apparatus which enables both phases to be easily and cleanly separated at the experimental temp. The law of mass action is not obeyed and various explanations of the discrepancies are offered. C. R. H.

Equilibrium in the system calcium cyanamide-sodium chloride. M. S. MAXIMENKO and J. I. IZRAILOVITSCH (Chimstr., 1935, 7, 411—413).—The equilibria $\text{CaCN}_2 + \text{C} \rightleftharpoons \text{Ca}(\text{CN})_2$ and $\text{Ca}(\text{CN})_2 + 2\text{NaCl} \rightleftharpoons \text{CaCl}_2 + 2\text{NaCN}$ have been studied with commercial black cyanide at 480— 1520° . The cyanide is completely decomposed at 480— 850° . The cooling must therefore be rapid in this temp. range. The decomp. products are $\text{CaCN}_2 + \text{C}$, the CaCN_2 reacting with C to form CaC_2 and N_2 . Formation of $\text{Ca}(\text{CN})_2$ begins at 900— 950° . Above 1400° irreversible decomp of $\text{Ca}(\text{CN})_2$ into the elements begins. CH. ABS. (e)

Application of the thaw-melt method to inorganic systems. II. A. BENRATH and E. HITZBLECK (J. pr. Chem., 1937, [ii], 148, 88—94; cf. A., 1935, 1322).—The systems, $\text{Co}(\text{NO}_3)_2\cdot 4\text{H}_2\text{O--Zn}(\text{NO}_3)_2\cdot 4\text{H}_2\text{O--Cd}(\text{NO}_3)_2\cdot 4\text{H}_2\text{O}$ and $\text{Co}(\text{NO}_3)_2\cdot 6\text{H}_2\text{O} + \text{Zn}(\text{NO}_3)_2\cdot 4\text{H}_2\text{O} \rightleftharpoons$

$\text{Co}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O} + \text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, have been examined. H. W.

Heat of sublimation of graphite. G. HERZBERG, K. F. HERZFELD, and E. TELLER (J. Physical Chem., 1937, 41, 325—331).—The spectroscopic val. for the heat of dissociation of CO should be 25% < the heat of sublimation of graphite in vac.; this is in agreement with experiment (Chem. Rev., 1937, 20, 145). F. R. G.

Thermochemical data for titanium oxides. N. NASU (Kinz.-no-kenk., 1935, 12, 411—418; cf. this vol., 31).—Vals. of ΔF , ΔH , and ΔS are calc. for the reactions $2\text{TiO}_2 + \text{H}_2 = \text{Ti}_2\text{O}_3 + \text{H}_2\text{O}$, $\text{Ti}_2\text{O}_3 + 0.5\text{O}_2 = 2\text{TiO}_2$, $2\text{Ti} + 3/2\text{O}_2 = \text{Ti}_2\text{O}_3$ and $2\text{TiO}_2 + \text{CO} = \text{Ti}_2\text{O}_3 + \text{CO}_2$. CH. ABS. (e)

Heat of formation of tricalcium silicate at 1300°. H. E. VON GRONOW (Zement, 1936, 25, 61—62; Chem. Zentr., 1936, i, 2908).—The heat of formation from $\beta\text{-}2\text{CaO} \cdot \text{SiO}_2 = -2$ to -3 g.-cal. per g.; the heat of transformation $\beta \rightarrow \gamma\text{-}2\text{CaO} \cdot \text{SiO}_2 = 8.8$ g.-cal. per g. at 675° and 6.0 g.-cal. per g. at 20°. J. S. A.

Heat of dissolution and dilution of formic acid. A. A. GLAGOLEVA (J. Gen. Chem. Russ., 1936, 6, 1769—1777).—The heat of dilution passes through a max. for 1:1.2 $\text{HCO}_2\text{H}-\text{H}_2\text{O}$ mixtures at 25° and 60°. The results agree with those calc. from Kirchhoff's formula. R. T.

Heats of combustion of liquid normal paraffin hydrocarbons from hexane to dodecane. R. S. JESSUP (J. Res. Nat. Bur. Stand., 1937, 48, 115—128).—Measurements made with a bomb calorimeter are recorded. The heat of combustion of liquid $n\text{-C}_n\text{H}_{2n+2}$ ($n = 6-12$) in O_2 at 1 atm. pressure, at 25°, is $259.28 + 648.84n + 0.2587n^2$ international kilojoules per g.-mol. A. J. E. W.

Heat of combustion of nitro-derivatives of naphthalene. M. BADOCHÉ (Bull. Soc. chim., 1937, [v], 4, 549—558).—The heats of combustion (at const. vol. and 17°) of 1- $\text{C}_{10}\text{H}_7\text{NO}_2$, 1:5- and 1:8- $\text{C}_{10}\text{H}_6(\text{NO}_2)_2$, and 1:3:8- and 1:4:5- $\text{C}_{10}\text{H}_5(\text{NO}_2)_3$ are 6875.9, 5289.7, 5295.5, 4256.6, and 4267.9 g.-cal. per g., respectively. E. S. H.

Conductivity of potassium chloride solutions. C. W. DAVIES (J.C.S., 1937, 432—436).—Measurements on dil. KCl solutions at 25° are in accord with the results of Shedlovsky (A., 1932, 699) and, together with data at 18°, suggest that conductivities based on the Kohlrausch scale are 0.07% > those based on Jones and Bradshaw's standard (A., 1933, 676). The equation $\Lambda = 149.92 - 93.85C^{1/2} + 50C$ represents the conductivity of very dil. solutions better than Shedlovsky's equation. It is considered that faulty cell design and inadequate earthing arrangements have not caused serious errors in previous investigations, but that considerable polarisation errors may be anticipated when a cell containing greyed electrodes is used outside a very restricted concn. range. J. W. S.

Differences between conductivity coefficients of strong electrolytes in the same solvent. M. HLASKO (Rocz. Chem., 1937, 17, 11—19).—The conductivity coeffs. of HF, HCl, HBr, and HI are

practically identical in H_2O , but differ in other solvents, to an extent which increases with diminishing dielectric const.; the order of the coeffs. for the acids is: $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$. A similar result is obtained for the salts MX ($\text{M} = \text{NH}_4, \text{K}, \text{Li}, \text{Rb}$; $\text{X} = \text{Cl}, \text{Br}, \text{I}$), and for the bases LiOH, NaOH , and KOH . The λ_∞ of different ions in the solvents studied ($\text{H}_2\text{O}, \text{MeOH}, \text{EtOH}, \text{Pr}^\circ\text{OH}, \text{C}_6\text{H}_5\text{N}, \text{AcOH}$, and EtCO_2H) increases in the series $\text{Li} < \text{Na} < \text{K} < \text{Rb} < \text{Cs} < \text{F} < \text{Cl} < \text{Br} < \text{I}$. R. T.

Graphical representation of Ostwald-Arrhenius and Kohlrausch-Debye-Huckel [conductivity] equations. J. G. VAN GINKEL (Rec. trav. chim., 1937, 56, 155—160).—In their application to experimental data the above equations are preferably utilised in a "reduced" form, the equiv. conductivity being divided by the conductivity at infinite dilution and the concn. by the dissociation const. R. C.

Transport numbers of unsymmetrical electrolytes and a simplified moving-boundary apparatus. G. S. HARTLEY and G. W. DONALDSON (Trans. Faraday Soc., 1937, 33, 457—469).—A simplified accurate moving-boundary apparatus is described and measurements for K_2SO_4 , $\text{K}_3\text{Fe}(\text{CN})_6$, and $\text{Co}(\text{NH}_3)_6\text{Cl}_3$ are recorded. The conductivities of the multivalent ions of these salts at infinite dilution at 25° are 80.8, 100.9, and 101.9, respectively. At low concns. the transport nos. of unsymmetrical electrolytes change with concn. as predicted by Onsager's theory, but at higher concns. the change is < that predicted by the theory. J. W. S.

Transport numbers of some salts in aqueous solution at higher temperatures. C. S. SAMIS (Trans. Faraday Soc., 1937, 33, 469—474).—The transport nos. for aq. solutions of KCl, AgNO_3 , ZnBr_2 , and $\text{K}_2\text{C}_2\text{O}_4$ have been determined at 40° and for HCl at 50°, by the moving boundary method. The limiting transport no. for K^+ in KCl at 40° is 0.4913 ± 0.0003 . The limiting mobilities of the ions at 50° and the limiting transport nos. for the above salts are calc. J. W. S.

Comparison of hydrogen, quinhydrone, and glass electrodes in magnesium sulphate solutions. E. S. AMIS and J. L. GABBARD (J. Amer. Chem. Soc., 1937, 59, 557—561).—The behaviour of the electrodes has been compared in aq. MgSO_4 of various concns. and p_{H} vals. The potential of the glass electrode is not affected by the presence of Mg^{++} in concns. up to 2M. The H_2O error of the glass electrode agrees with Dole's equation (A., 1932, 126, 1207). The glass electrode is suitable for measuring the "salt error" of the quinhydrone electrode in solutions buffered with traces of HCl; this error depends on the p_{H} of the solution. E. S. H.

Potential developed by the hydrogen electrode and by the glass electrode in concentrated acid solutions. J. A. CRANSTON and H. F. BROWN (J. Roy. Tech. Coll., 1937, 4, 32—45).—The potential of the H₂ electrode in solutions of HCO_2H , AcOH, EtCO_2H , H_3PO_4 , and H_2SO_4 increases with acid concn. In $\text{H}_2\text{SO}_4 > 65\%$ and in AcOH and $\text{EtCO}_2\text{H} > 80\%$

the behaviour of the H_2 electrode is abnormal. The glass electrode is untrustworthy, the electrode being permanently changed with conc. H_2SO_4 and H_3PO_4 . The magnitude of the junction potential between saturated KCl and H_2SO_4 has been calc. C. R. H.

Hydrolysis of salts. I. Measurement by the glass electrode. II. KCN, $CuSO_4$, $NaHSO_4$, and $Pb(NO_3)_2$. J. A. CRANSTON and H. F. BROWN (J. Roy. Tech. Coll., 1937, 4, 46—53, 54—60).—I. The advantages and disadvantages of the H_2 , quinhydrone, and glass electrodes for the study of salt hydrolysis are discussed. When the glass electrode is used as a reversible H_2 electrode, its behaviour is apparently unaffected by neutral salts at concns. $> N$.

II. The vals. have been measured at various dilutions using the glass electrode. The average val. for the hydrolysis const. for KCN is 1.27×10^{-5} at 15° . The average val. for the dissociation const. of $NaHSO_4$, regarding it as an acid, is 0.146 calc. from Rudolphi's formula. C. R. H.

Reactions of scandium at the dropping mercury cathode. R. H. LEACH and H. TERREY (Trans. Faraday Soc., 1937, 33, 480—486).—The deposition potential of Sc at the dropping Hg cathode is -1.84 ± 0.01 volts, relative to the normal Hg_2Cl_2 electrode. The polarographic method can be used for detection and determination of Sc simultaneously with Al in acid solution under conditions which are detailed. J. W. S.

Potential of iron and other metals in hydrochloric and nitric acids. M. L. GUITTON (Bull. Soc. chim., 1937, [v], 4, 570—580).—The potentials of H_2 , Pt, Al, and Fe in aq. HCl and of Ni, Zn, Cu, Pb, Al, Sn, Fe, and stainless steels in aq. HNO_3 have been determined as a function of concn. of acid. The curves are discussed in relation to corrosion. E. S. H.

Electrochemical investigation of the anti-corrosive properties of sodium nitrite. A. V. SOLOVIEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 295—298).—The potential of an Fe electrode in 0.5N- $NaNO_2$ falls from an initial val. of -28 mv. to -390 mv. in 48 hr., and does not vary between the electrolyte-air boundary and the body of the solution. The potential of Fe in 0.5N- $NaCl$ is reduced by the addition of $NaNO_2$. On contact with Zn, Cd, Ni, Pb, and Cu in 0.5N- $NaNO_2$, Fe becomes the cathode. O. D. S.

Cell for measurement of the thermodynamic properties of hydrochloric acid in dioxan-water mixtures. H. S. HARNED and J. O. MORRISON (Amer. J. Sci., 1937, [v], 33, 161—173; cf. A., 1923, ii, 117; 1925, ii, 538, 1061; 1936, 1463).—E.m.f. vals. for H_2 -Ag|AgCl electrode combinations in dioxan- H_2O solutions of HCl with dielectric consts. of 10—80 have been determined at 0° , 5° , 10° , 15° , 20° , 25° , 30° , 35° , 40° , 45° , and 50° , with a mean error of ± 0.03 mv. Electrode poisoning from rubber stoppers was eliminated by the use of ground glass joints. R. C. M.

Electrochemical behaviour of metals which furnish cations of different valency. I. R. PION-

TELLI (Gazzetta, 1936, 66, 787—791).—The electrochemical behaviour of a metal forming two ions of different valency is discussed in relation to the two normal electrode potentials of the metal.

O. J. W.

Theory of electrochemical systems with many electrodes and its application to corrosion problems. I. Potentials of binary systems. G. V. AKIMOV and N. D. TOMASCHOV (J. Phys. Chem. Russ., 1936, 8, 623—639).—The potential of a "binary electrode," consisting, e.g., of Cu and Cd plates, depends on the relative situation and distances of the plates and the liquid junction, on the relative size of the plates, and on the polarisation of the cathodic plate; a theory accounting for these effects is put forward. J. J. B.

Capacity of a bright platinum electrode in various electrolytes, and its dependence on the treatment of the electrode. B. ERSCHLER and M. PROSKURNIN (J. Phys. Chem. Russ., 1936, 8, 689—695; cf. A., 1936, 1207).—The capacity is large (up to 1000 μF . per sq. cm.) when the potential of the electrode coincides with that of the H_2 electrode; it is lowered by anodic polarisation, by previous heating of the electrode in H_2 , and by impurities. J. J. B.

New effect in electroodic processes. E. S. SARKISOV and P. F. MICHALEV (J. Phys. Chem. Russ., 1936, 8, 538—542).—The relation between cathodic polarisation and the structure of deposits of Cu and Ni has been studied by the use of an apparatus permitting change of the p.d. (V) between the electrodes without changing the electrolyte and the c.d. Increase in V increases the polarisation and changes correspondingly the character of the deposit. E. R.

Hydrogen overvoltage at high current densities. B. KABANOV (J. Phys. Chem. Russ., 1936, 8, 486—491).—Overvoltage of H has been measured at Pt, Ag, and Ag amalgam cathodes in 5N solutions of HCl and H_2SO_4 , up to c.d. 100 amp. per sq. cm. At 1.5 volts, the overvoltage is still a linear function of c.d. E. R.

Electrochemical reduction potential of maleic and fumaric acids. G. SEMERANO and G. BETTINELLI (Gazzetta, 1936, 66, 744—749).—The mol. reduction potentials at the dropping Hg cathode of maleic and fumaric acids are -0.409 and -0.414 volts, respectively. The difference in the free energy of reduction of the two acids is 230 g.-cal. It is suggested that the acids dissociate at the electrode into the free radical $CH \cdot CO_2H$. O. J. W.

Photovoltaic effects of naphthylenediamines. (MLLE.) H. T. NGA (Compt. rend., 1937, 204, 763—764; cf. A., 1936, 665).—The photopotentials of 1:2-, 1:8-, and 2:7- $C_{10}H_8(NH_2)_2$ in aq. solutions of K_2SO_4 , KI, HCO_2Na , and $KClO_3$ are recorded. Vals. for 1:2- $C_{10}H_8(NH_2)_2$ are consistently $<$ those for the others. A. J. E. W.

Polarographic study of titano-tartaric complexes. V. CAGLIOTI and G. SARTORI (Gazzetta, 1936, 66, 741—744).—In solution tartaric acid forms a complex with $TiCl_4$ in which the mol. ratio of Ti: $C_4H_6O_6$ is 1:1, and with $Ti(OH)_4$ in which the ratio Ti: $C_4H_4O_6Na_2$ is 2:3. O. J. W.

Application of oxidation-reduction potentiometric titration to the determination of the constitution of complex compounds. A. A. GRUNBERG and D. I. RJAETSCHIKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 119—122; cf. A., 1936, 953).—The titration curves for Magnus' green salt in conc. H_2SO_4 , and for $\text{Pt}(\text{NH}_3)_2\text{Br}_2$ with KMnO_4 and KBrO_3 at room temp. and 85° , show one break corresponding with the total Pt. The curve for $[\text{Pt}(\text{NH}_3)_4][\text{PtBr}_4]$ in HCl with KBrO_3 shows one break in the cold, but two at 85° corresponding with the end-points of $[\text{Pt}(\text{NH}_3)_4]^{++}$ and $[\text{PtBr}_4]^-$. The curve for $[\text{Pt}(\text{NH}_3)_4][\text{Pt}(\text{CN})_4]$ with KMnO_4 shows breaks at the end-points of $[\text{Pt}(\text{NH}_3)_4]^{++}$ and $[\text{Pt}(\text{CN})_4]^-$. The curve for the monomeric form $\text{Pt}(\text{NH}_3)_2(\text{CN})_2$ shows one break corresponding with the total Pt.

O. D. S.

Oxidation-reduction potential of reductive acid. (MME.) N. MAYER (J. Chim. phys., 1937, 34, 109—116).—A detailed account of work already noted (this vol., 140).

Oxidation-reduction potential of ascorbic acid. I. C. GHOSH and T. L. R. CHAR (Z. physiol. Chem., 1937, 246, 115—123).—At p_{H} 2.5—7.5 the anaerobic oxidation of ascorbic acid (I) is reversed by H_2S . At p_{H} 2.5—7.7 the oxidation-reduction potential of (I) is 0.370—371 volt.

W. McC.

Oxidation-reduction. XXIII. Ascorbic acid. E. G. BALL (J. Biol. Chem., 1937, 118, 219—239).—The p_{H} of the oxidation-reduction system containing ascorbic acid (I) can be measured by using mediators, over the p_{H} range 1.0—8.6. The normal potential at 30° is +0.390 volt. The first dissociation const. of (I) corresponds with p_{K} 4.21. At $p_{\text{H}} > 5$ the oxidant (dehydroascorbic acid) (II) is unstable; this fact is discussed in relation to the behaviour of (I) and its derivatives. (I) may be determined electrometrically, e.g., at p_{H} 4.6 by titration with $\text{K}_3\text{Fe}(\text{CN})_6$ with thionine as mediator; results with orange juice agree well with other methods, and indicate that the juice is normally free from (II).

F. A. A.

Two-step oxidation-reduction of phthiocol. E. S. HILL (Proc. Soc. Exp. Biol. Med., 1936, 35, 363).—Solutions of phthiocol at $p_{\text{H}} > 10$ are reduced slowly and an intermediate violet colour is observed. In the reductive titration, separation of the two steps begins at about p_{H} 9.0. The max. val. of the ratio semiquinone : total dye is about 0.5 at p_{H} 13.4—14.3.

H. J. E.

Mechanism of redox reactions. I. Qualitative relationships. A. M. ZANKO and V. F. STEFANOVSKI (J. Gen. Chem. Russ., 1937, 7, 100—110).—Anomalous forms of curves obtained in the titration of $\text{K}_2\text{Cr}_2\text{O}_7$ by FeSO_4 , $\text{K}_4\text{Fe}(\text{CN})_6$, K_3AsO_3 , SnCl_2 , Na_2SO_3 , or CrSO_4 , under various conditions of acidity and concn., are ascribed to the formation of intermediate products.

R. T.

Oxidation-reduction potentials and their applications. S. GLASSTONE (Inst. Chem., 1937, 28 pp.).—A lecture.

Introduction of thermodynamic variables into reaction kinetics. M. G. EVANS and M. POLANYI

(Trans. Faraday Soc., 1937, 33, 448—452).—Mathematical. J. W. S.

Application of affinity to coupled reactions. P. VAN RYSELBERGHE (Bull. Acad. roy. Belg., 1936, [v], 22, 1330—1335).—A general thermodynamic discussion of coupled reactions, and the conditions of velocity which they satisfy, is given. R. S. B.

Kinetics of consecutive reactions with a common reactant. A. SKRABAL (Rec. trav. chim., 1937, 56, 145—154).—A claim for priority over Stuurman (A., 1936, 1468). The theory is extended to cover the formation of two isomeric intermediate products. R. C.

Rates and mechanisms of some inorganic reactions. H. P. TREFFERS (J. Chem. Educ., 1937, 14, 74—83).—Recent kinetic studies of many reactions, especially those of use in analytical chemistry, are reviewed. L. S. T.

Periodic reactions. F. M. SCHEMJAKIN (Kolloid. Shurn., 1936, 2, 259—260).—Theoretical. J. J. B.

Deduction of reaction mechanisms from the theory of absolute rates. A. E. STEARN and H. EYRING (J. Chem. Physics, 1937, 5, 113—124).—Inconsistencies in the simple kinetic collision theory are discussed and compared with mechanisms based on the theory of abs. rates, particularly for the Menschutkin reaction. The activated complex closely resembles the final products in configuration. The free energy of activation of proton transfer has been evaluated from data on the conductivity of H_2O and on the dielectric relaxation of ice. The mechanism of the denaturation of proteins is discussed in relation to their energies of activation and a H-bond mechanism is consistent with the newer theory of activation.

W. R. A.

Latent energy of combustion. W. T. DAVID (Phil. Mag., 1937, [vii], 23, 345—355; cf. A., 1936, 432, 1343).—Published work is summarised and discussed. Latent energies of 1—10% of the heat of combustion, H , in large-vessel explosions and of 5—28% of H in flames burning at const. pressure have been observed. These differences are interpreted in terms of the pressure in the flame front.

J. G. A. G.

Lower limit of reaction between hydrogen and oxygen. A. BIRON and A. NALBANDJAN (Acta Physicochim. U.R.S.S., 1937, 6, 43—56).—The lower limit (p) of ignition of H_2 - O_2 (O_2 40%) mixtures in re-fused Pyrex vessels is not sensibly affected by the presence of A, thus confirming the theory of Kassel and Storch (A., 1935, 709). In SiO_2 vessels where p is considerably higher, addition of A diminishes p in proportion to the partial pressure of A, in accordance with the theory of Bursian and Sorokin (A., 1931, 688). In both cases p is the partial pressure of $\text{H}_2 + \text{O}_2$. Experiments are recorded showing the relation between p and the % composition of A-free H_2 - O_2 mixtures. F. L. Ü.

Lower limit of inflammation in "oxyhydrogen" gas. N. SEMENOVA (Acta Physicochim. U.R.S.S., 1937, 6, 25—42).—A method is described whereby consistent vals. for the lower limit (p) of ignition of $2\text{H}_2 + \text{O}_2$ can be obtained. With Pyrex

vessels of diameter (d) ≤ 15 cm., the relationship $pd - \text{const.}$ is shown to be accurate within 2.5%. For smaller diameters pd is less, e.g., 15–25% less for 6 mm. In agreement with theory, the relation between p and temp. is expressed by $p/T = ae^{E/RT}$, where $E = 11,000$ g.-cal. F. L. U.

Formation of hydrogen peroxide from hydrogen atoms and oxygen molecules. G. KORNFELD (Z. physikal. Chem., 1937, B, 35, 236–238).—A H_2O_2 mol. is able to break two chains in the H_2 – Cl_2 reaction. Bodenstein and Schenk's rejection (A., 1933, 577) of the chain mechanism $\text{HO} + \text{H}_2 = \text{H}_2\text{O} + \text{H}$ for the formation of H_2O_2 by the H_2 – Cl_2 reaction in presence of O_2 on the grounds that the H would propagate the chains is therefore unjustifiable. R. C.

Experimental verification of the formula $Li^4 = \text{const.}$ for the ignition limit of gaseous mixtures with the break spark. P. P. PIROTZKI (Acta Physicochim. U.R.S.S., 1937, 6, 131–136).—The relation between the min. val. of the current (i) needed for the ignition of a CH_4 –air mixture by a break spark in a circuit of self-induction L is given with fair accuracy by $Li^4 = \text{const.}$, when L varies from 0.508 to 4 henries and the p.d. is 70 or 110 volts d.c. This result throws doubt on the importance hitherto attributed to the energy of the magnetic field. F. L. U.

Explosion limits of gaseous mixtures. III. Explosion limits of mixtures of carbon monoxide and of methane. M. RIVIN and A. SOKOLIK (Acta Physicochim. U.R.S.S., 1937, 6, 105–114; cf. A., 1936, 1468).—The effect of addition of H_2 to $2\text{CO} + \text{O}_2$, and of N_2 to $\text{CH}_4 + 2\text{O}_2$, on the explosion limits of the respective mixtures has been studied. In the former the change in the explosion limit produced by H_2 is analogous to the change in ignition temp. and rate of propagation of the flame. In the CH_4 mixtures the lower limit is raised by addition of N_2 until $[\text{N}_2]/[\text{O}_2] = 2$, beyond which an explosion wave is not formed. The existence of two possible structures of the explosion wave is indicated. F. L. U.

Two-stage process of thermal ignition of an [equimolecular] mixture of butane and oxygen. E. A. ANDREEV (Acta Physicochim. U.R.S.S., 1937, 6, 57–64).—The increase of pressure with time has been measured at different temp. for an equimol. mixture of $n\text{-C}_4\text{H}_{10}$ and O_2 at an initial pressure of 382 mm. Over the range 287–441° the ignition process is characterised by two stages, in the first of which a cold flame is formed, accompanied by a large quantity of intermediate products, whilst in the second a hot flame occurs. With rise of temp. the pressure increase associated with the cold flame decreases, and vanishes at 461°. At 279° only the cold flame occurs. F. L. U.

Spontaneous ignition under pressure of simpler aliphatic hydrocarbons, alcohols, and aldehydes. G. P. KANE, E. A. C. CHAMBERLAIN, and D. T. A. TOWNEND (J.C.S., 1937, 436–443).—Previous work on the effect of pressure on the spontaneous ignition of paraffin–air mixtures is discussed with respect to the “knocking” properties of these fuels.

In the series derived from CH_4 , C_2H_6 , and C_3H_8 , ease of spontaneous ignition is in the order aldehyde $>$ alcohol $>$ paraffin, but the time lag is $\text{PrOH} > \text{C}_3\text{H}_8$. With paraffins containing $> 4\text{C}$, the ease of ignition is paraffin $>$ alcohol, suggesting that the importance of the intermediately formed aldehydes is $<$ in the case of the lower paraffins. Cool flames were observed with certain binary mixtures of air with MeCHO , C_3H_8 , PrOH , and EtCHO . J. G. A. G.

Influence of nitrogen on the inflammation of diethyl ether. J. BARON and P. LAFFITTE (Compt. rend., 1937, 204, 777–779).—The effect of added N_2 on the temp. of inflammation of Et_2O – O_2 mixtures is in accord with the Semenov chain theory. A. J. E. W.

Heterogeneous combustion of mixtures of carbon monoxide and oxygen on a vitreous surface. M. PRETTE (Compt. rend., 1937, 204, 775–777; cf. A., 1927, 28; 1930, 299; 1932, 916; 1933, 30).—The reaction rate in a Pyrex vessel packed with Pyrex fragments, at about 550°, is $k(p_{\text{CO}} + p_{\text{O}_2})p_{\text{O}_2}/(p_{\text{CO}} + ap_{\text{CO}})$, where p_{O_2} is the pressure of the reactant which is in excess, and a depends on the initial composition of the mixture. The mechanism probably involves the reaction of adsorbed mols. with mols. in the gas phase. A. J. E. W.

Ignition of gaseous mixtures by hot particles. R. S. SILVER (Phil. Mag., 1937, [vii], 23, 633–657).—An arrangement for finding the min. temp. at which a hot sphere will cause ignition of gaseous mixtures of known composition is described. Data are tabulated and plotted for quartz and Pt spheres of various diameters and coal gas–air, H_2 –air, and C_5H_{12} –air mixtures. In the first two cases the ignition point was independent of, and in the third case showed slight dependence on, sphere substance. The min. ignition point varied with sphere size, diminishing with increasing sphere diameter. In all cases min. ignition point was much above the “ignition temp.” of the mixture. A qual. theoretical treatment is developed. N. M. B.

Factors influencing the height of the combustion levels attained in flame gases. W. T. DAVID (Nature, 1937, 139, 289–290).—Factors such as the nature of the combustion gases, nature of the diluent gases, size of vessel, and pressure, affecting this level in flames and explosions are discussed. The combustion level may be raised by increasing the pressure of the gases before combustion or by arranging for high instantaneous pressure in the flame front. L. S. T.

Inflammation of gaseous mixtures. VII. Induction period of cold flames in pentane–oxygen mixtures. B. V. ARVASOV and M. B. NEUMAN (J. Phys. Chem. Russ., 1936, 8, 543–558).—The dependence of the induction period of the cold flame of $\text{C}_5\text{H}_{12} + \text{O}_2$ on temp., diameter of the vessel, total pressure, partial pressure of N_2 , and addition of MeCHO and NO_2 has been studied. A formula is derived and discussed on the basis of the theory of chain reactions. E. R.

Ignition and self-inflammation of ammonia and of nitrogen–hydrogen mixtures. N. V. TOKAREV and N. I. NEKRASSOV (J. Phys. Chem. Russ.,

1936, 8, 504—513).—The min. temp. ($t_{\min.}$) of self-inflammation of $H_2 + N_2 + O_2$ and $NH_3 + O_2$ are 440° and 700° , respectively; the min. pressures ($p_{\min.}$) are 5 and 10 mm.; $t_{\min.}$ and $p_{\min.}$ are independent of composition of the mixture. The limits of ignition by a spark of the same mixtures are 5—90% H_2 and 10—80% NH_3 ; $p_{\min.}$ is a hyperbolic function of the composition, with a min. at 36% H_2 (or NH_3), and a linear function of temp. Extrapolated curves of $p_{\min.} = f(t)$ for spark ignition intersect in a point identical with $p_{\min.}$ for self-inflammation, showing the essential identity of the mechanisms of both reactions.

E. R.

Kinetics of oxidation of hydrides in the gaseous phase. II. Oxidation of phosphine. P. S. SCHANTAROVITSCH. **III. Oxidation of hydrogen sulphide.** B. JAKOVLEV and P. S. SCHANTAROVITSCH (Acta Physicochim. U.R.S.S., 1937, 6, 65—70, 71—94).—II. As with SiH_4 (A., 1936, 163), the pressure limits of ignition of PH_3-O_2 mixtures depend on the composition. As the temp. is raised the lower limit falls and the upper rises. Data are given for mixtures with 10, 22, 32, and 57% of PH_3 .

III. H_2S-O_2 mixtures show, at pressures considerably > the ordinary upper limit, an additional upper limit above which ignition again takes place. This third limit coincides with that described by several previous workers. The ordinary ignition region is considerably displaced towards lower temp. by increasing $[O_2]$, and a definite relation exists between the ignition limits and composition. Outside the ignition limits, and also during the induction period preceding an explosion, a slow reaction occurs, the velocity of which increases with pressure and appears to differ from an ignition reaction.

F. L. U.

Homogeneous unimolecular decomposition of gaseous alkyl nitrites. VIII. Decomposition of ethyl and n-propyl nitrites at low pressures and a general discussion of the results for the entire series. E. W. R. STEACIE and S. KATZ (J. Chem. Physics, 1937, 5, 125—130).—The kinetics of the decomp. of $EtO\cdot NO$ and $Pr\cdot O\cdot NO$ have been investigated at low pressures, and so far as the effect of pressure on the rate is concerned can be explained, as can the results for the other members of the same series, by the theory of Kassel. This theory does not, however, explain the increase in the high-pressure rate with increasing mol. complexity. Probably this arises from a progressive change in binding energy as a series is ascended.

W. R. A.

Thermal decomposition of ethane. H. SACHSSE (J. Chem. Physics, 1937, 5, 199—200).—The assertion by Steacie and Phillips (A., 1936, 1344) that the $[H]$ required by the chain mechanism for the decomp. of C_2H_6 is in agreement with Sachsse's experimental val. is denied. Using Steacie's data it is shown that the theory does not agree with the experimental val.

W. R. A.

Factors influencing rates of reaction in solution. R. A. OGG, jun., and O. K. RICE (J. Chem. Physics, 1937, 5, 140—143).—A survey is given of factors peculiar to solutions which may affect rates of reaction, e.g., restriction of free space and solvation effects. An explanation of the parallelism between

A and E of the reaction equation $K = Ae^{-E/RT}$ is advanced.

W. R. A.

Theory of electro-kinetic effects in solution: reactions between ions and polar molecules. E. A. MOELWYN-HUGHES (Proc. Roy. Soc., 1936, A, 157, 667—679).—The derivation of the expression $k = PZe^{-E_A/RT}$ has been re-investigated, and an expression for the average electrostatic energy of interaction between the ion and the reacting dipole is introduced. The conditions under which P can deviate from unity are thus determined; theoretical predictions relating to the influence of electrolytes on k , of the temp. on E_A , of the charge on the ion, and of the sign of the dipole on P are consistent with known facts.

L. L. B.

Behaviour of hypophosphorous and phosphorous acids and their mono-esters towards iodine. Comparative kinetic study. P. NYLÉN (Z. anorg. Chem., 1937, 230, 385—404).—The kinetics of reaction of H_3PO_2 , H_2PO_3 , H_2MePO_3 , H_2EtPO_3 , and H_2PrPO_3 with I at 20° or 25° have been determined. The structures of these substances are discussed in the light of the results.

E. S. H.

Action of potassium halides on mercurous nitrate. J. A. FYALKOV (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 563—571).—Addition of K salts to aq. $HgNO_3$ results in the reactions $KX + HgNO_3 \rightarrow HgX + KNO_3$; $2HgX \rightarrow Hg + HgX_2$. The velocity of the second reaction falls in the series $X = CN > CNS > I > Br > Cl$.

R. T.

Possible acid-dissociation of metal-ammonia ions, and its bearing on certain reactions. (A) F. J. GARRICK. (B) J. S. ANDERSON, N. L. SPOOR, and H. V. A. BRISCOE (Nature, 1937, 139, 507—508, 508). (A) NH_3 mols. in cobaltammines appear, by co-ordination, to be unable to form NH_4 ions, and these co-ordinated NH_3 groups can dissociate as acids according to $(Co_6NH_3)^{+++} (Co_5NH_3.NH_2)^{++} + H$.

(B) The mechanism of H interchange given is $[Co(NH_3)_6]^{+++} \rightarrow [Co(NH_3)_5NH_2]^{++} + H^+$; $[Co(NH_3)_5NH_2]^{++} + H_2O \rightarrow [Co(NH_3)_5NH_2D]^{++} + OH^-$; $H + OH \rightarrow H_2O$, where the second reaction determines the rate of reaction, for which an expression is deduced. In agreement with this, it is found for the interchange between H_2O and hexamminecobaltic chloride (I) containing D that (i) the rate of interchange is inversely $\propto [H^+]$, (ii) for a given concn. of (I), it is independent of the initial "heaviness" of (I), and (iii) for (I) of given heaviness, it is inversely $\propto \sqrt{\text{concn. of (I)}}$.

L. S. T.

Kinetics of co-ordination reactions in the cobaltammine series. I. Aquotisation of the chloropentammine ion. F. J. GARRICK (Trans. Faraday Soc., 1937, 33, 486—496).—The aquotisation of the $[Co(NH_3)_5Cl]^{++}$ ion at $20-30^\circ$ is unimol., and is opposed by a bimol. back reaction. The velocity coeff. of the forward reaction is given by $k = 2.4 \times 10^{13} \times e^{-23700/RT}$. The effects of inert salts are sp. and dependent on the anion. They are positive in all cases investigated except with ClO_4^- .

J. W. S.

Kinetics of the reaction between potassium dichromate and sodium sulphite in aqueous

solution. A. SCONZO (Atti V Congr. Naz. Chim., 1936, 2, 557—569).—When $K_2Cr_2O_7$ and Na_2SO_3 are mixed in the mol. ratio 1 : 1 in cold aq. solution CrO_2 is formed together with Cr_2O_3 and small amounts of basic sulphites. The latter, however, are not formed when the solutions are boiled. In this case $CrO_2 \cdot H_2O$ is obtained. With an initial mol. ratio of 2 : 1 the reaction is similar, but with a ratio of 1 : 2, both in the cold and on boiling, a mixture of various basic sulphites is obtained. The reaction velocity in dil. solution, starting with a mol. ratio 1 : 1, at every instant $\propto [H^+][Na_2SO_3]$. O. J. W.

Reaction between bromosuccinate ion and thiosulphate ion. F. A. LONG and A. R. OLSON (J. Physical Chem., 1937, 41, 267—281).—The rate of reaction, studied by titration and polarimetric methods, is determined by the initial formation of a β -lactone, for which the heat of activation of 20,400 g.-cal. is independent of initial and added salt concn. and of temp. between 12.5° and 50°. F. R. G.

Kinetics of condensation polymerisation; reaction of ethylene glycol with succinic acid. P. J. FLORY (J. Amer. Chem. Soc., 1937, 59, 466—470).—Re-calculation of published data (A., 1936, 685, 1209) shows the reaction to be predominantly a termol. process. The rate $\propto [OH]$ and $[CO_2H]^2$. The energy of activation is about 25 kg.-cal. E. S. H.

Kinetics of bromine addition to olefinic compounds. P. W. ROBERTSON, N. T. CLARE, K. J. McNAUGHT, and G. W. PAUL (J.C.S., 1937, 335—343).—The rate of addition of Br to cinnamic, *trans*-cinnamic, undecenoic, and acrylic (I) acids and allyl acetate, chloroacetate, benzoate, and phenylacetate has been studied in dry CCl_4 and AcOH at 0—50°. In CCl_4 , reaction probably results from impact of Br_2 on a surface film of the unsaturated compound (II). The stability of the film decreases with decrease of concn. and with rise of temp., and under these conditions the rate is diminished, and the reaction may become homogeneous and termol. HBr catalyses the reaction, which remains predominantly heterogeneous, but H_2O has little effect. In AcOH, the reactions have low heats of activation, are homogeneous, and termol.; the process involves one mol. of (II) and $2Br_2$. H_2O changes the order from termol. to bimol. and increases the velocity, since the effect of the more frequent collisions is not offset by the increased energy of activation. *trans*-Isomerides show irregularities owing to partial stereoconversion, which is complete in presence of HBr. HBr does not catalyse the Br_2 -addition except in the case of (I) and vinyl bromide. With (I), the Br_2 is activated by the HBr and the reaction becomes bimol. J. G. A. G.

Reaction of sugars with boric acid. F. J. BERENSCHEIN and A. U. SCHPAKOVSKI (Ukrain. Chem. J., 1936, 11, 433—455).—The dissociation const. of H_3BO_3 is increased in presence of dulcitol (I), arabinose (II), xylose, or mannose; H_3BO_3 may be titrated in presence of ≤ 2 mols. of (I) or 8 of (II) per mol. of H_3BO_3 . The $[\alpha]$ and the velocity v of mutarotation of the sugars are unaffected by presence of H_3BO_3 . The v of glucose, (II), or galactose (III), but not of fructose, rises in presence of borax, and the $[\alpha]$ falls, in the case of mono- but not di-saccharides, to

an extent $\propto [Na_2B_4O_7]$. Laevorotatory solutions of (III) are obtained in presence of 0.1M-borax when the concn. of (III) $\geq 1.8\%$. R. T.

Bromine oxidation and mutarotation measurements of α - and β -aldoses.—See A., II, 177.

Thermal polymerisation of styrene in solution. J. W. BREITENBACH and H. RUDORFER (Monatsh., 1937, 70, 37—43).—The polymerisation of styrene has been studied at 100° and in PhMe, xylene, dioxan, and $C_{10}H_{18}$ solution. J. W. S.

Velocity of reaction between aldehydes and ketones. II. Reaction between furfuraldehyde and acetophenone. III. Reaction between benzaldehyde and acetone. IV. Reaction between benzaldehyde and acetophenone. E. K. NIKITIN (J. Gen. Chem. Russ., 1937, 7, 9—13, 71—79, 148—150).—II. The velocity of reaction between furfuraldehyde (I) and CPhMe \propto concn. of (I). Furfurylideneacetophenone gives an intense yellow coloration in acid solution, and the reaction is adapted to the detection of (I) (≤ 1 p.p.m.), as well as to the colorimetric determination of (I) or CPhMe.

III. The velocity of reaction of PhCHO with $COMe_2$ in alkaline aq. solution $\propto [PhCHO]^2$. The greenish-yellow coloration given by the condensation product in acid solution serves for the detection (≤ 100 p.p.m.) or determination of PhCHO.

IV. The velocity of reaction of PhCHO with CPhMe $\propto [PhCHO]$. The condensation product gives a yellow coloration in acid solution, serving for detection of $\leq 0.1\%$ of either component. R. T.

Complex group of reactions involved in the final stages of the idealised hydrolysis of aqueous solutions of sodium bromoacetate. (Mrs.) M. S. BURR and H. M. DAWSON (Proc. Leeds Phil. Soc., 1937, 3, 293—299).—The rate of formation of NaBr in the final stages (90—100%) of the hydrolysis of $CH_2Br \cdot CO_2Na$ has been studied under conditions precluding complications due to the formation of intermediate compounds. Data obtained confirm the six reaction stages previously reported (cf. A., 1936, 685). The max. velocity at 5% idealised hydrolysis of $N \cdot CH_2Br \cdot CO_2Na$ is similarly interpreted. N. M. B.

Hydrolysis of alkyl halides. II. S. C. J. OLIVIER (Rec. trav. chim., 1937, 56, 247—262; cf. A., 1934, 971; 1937, II, 1).—The velocities of hydrolysis of α -bromo-, α -bromo- β - and γ -methylpentane, α - and β -bromo- and α -chloro-hexane, and α -bromo-heptane and -octane by aq. $COMe_2$ solutions of H_2SO_4 and KOH, and by aq. $COMe_2$ have been measured. The reactions are unimol., and catalysed by OH^- but not by H^+ . The ratio rate of alkaline hydrolysis : rate of acid hydrolysis diminishes with increasing proximity of Me to halogen, but is appreciable only when the Me and halogen are attached to the same C. The rate of hydrolysis of α -bromohexane is 16% slower in $D_2O \cdot COMe_2$ than in aq. $COMe_2$. J. D. R.

Salt effect in rearrangement of benzil-*o*-carboxylic acid.—See A., II, 195.

Solutions in liquefied gases. XVI. Kinetics of the ammonolysis of desmotroposantonin and

of ethyl tartrate in liquid ammonia in presence of ammonium salts. A. I. SCHATTENSTEIN (J. Phys. Chem. Russ., 1936, 8, 696—708).—The rate of reaction was measured polarimetrically. Desmotroposantonin does not react with liquid NH_3 alone; in catalytic power, $\text{NH}_4\text{Cl} > \text{NH}_4\text{Br} > \text{NH}_4\text{I}$. $(\text{OH}\cdot\text{CH}\cdot\text{CO}_2\text{Et})_2$ reacts even in absence of salts; the rate is increased by $\text{NH}_4\text{Cl} > \text{NH}_4\text{Br} > \text{NH}_4\text{NO}_3 > \text{NH}_4\text{I} > \text{NH}_4\text{ClO}_4$. J. J. B.

Exchange of hydrogen between pyrrole and water. M. KOIZUMI and T. TITANI (Bull. Chem. Soc. Japan, 1937, 12, 107—108).—In the range $p_{\text{H}} 14\text{--}2$ pyrrole exchanges only one H in presence of D_2O at 30° (A., 1936, 1338). When, however, the acidity is increased to $p_{\text{H}} 2\text{--}1$ all five H are exchangeable with measurable velocity. Below $p_{\text{H}} 1$ the exchange becomes immeasurably rapid. The distribution quotient $k(\text{CH}/\text{H}_2\text{O}) = 0.70$, compared with $k(\text{NH}/\text{H}_2\text{O}) = 0.88$. The results are interpreted as indicating a desmotropic change in the pyrrole mol. F. L. U.

Photographs at intervals of 0.0001 second of phenomena accompanying the detonation of a shattering explosive. A. MICHEL-LÉVY and H. MURAOUR (Compt. rend., 1937, 204, 576—579; cf. A., 1934, 943, 1313; 1935, 713; 1936, 7, 568).—The photographs confirm that luminosity accompanying the detonation is due to the effects of the shock wave on the surrounding gases. A. J. E. W.

Kinetics of dehydration of magnesium sulphate heptahydrate. A. S. MIKULINSKI and E. N. PODTIMSCHENKO (J. Phys. Chem. Russ., 1936, 8, 600—608).—The velocity of dehydration of $\text{MgSO}_4\cdot 7\text{H}_2\text{O}$ in an air stream has been measured, at $50\text{--}200^\circ$. It is assumed that the process proceeds in two stages: $7\text{H}_2\text{O} \rightarrow 6\text{H}_2\text{O} + \text{H}_2\text{O}$, and that its velocity depends on two consts., the first being that of a chemical reaction and the second that of a diffusion. These consts. are calc., and their logs represented by straight lines as functions of $1/T$. The activation energy of the dehydration is calc. to be 1670 g.-cal. per mol. of H_2O . E. R.

Calculation of the activation energy of dehydration of magnesium sulphate. A. S. MIKULINSKI and R. N. RUBINSTEIN (J. Phys. Chem. Russ., 1936, 8, 609—612).—The accuracy of the result obtained (cf. preceding abstract) is discussed. E. R.

Detonation of ammonium nitrate.—See B., 1937, 395.

Oxidisability of nickel. G. VALENSI (Bull. Soc. chim., 1937, [v], 4, 405—415; cf. A., 1937, I, 88).—Pure Ni, annealed in vac., begins to oxidise in O_2 at 550° ; Ni reduced from the oxide at 750° begins to oxidise at 320° . The behaviour in O_2 and air is the same, but the reaction is catalysed by H_2O vapour. The velocity of oxidation is hardly affected by cold-working, polishing, or annealing in H_2 , and is the same for pure and 98.7% Ni. E. S. H.

Periodic dissolution of iron in nitric acid. M. KARSCHULIN (Arh. Hemiju, 1936, 10, 89—97).—A reddish-brown layer forming at the surface of Fe immersed in HNO_3 is shown spectrographically to

contain $\text{Fe}(\text{NO})(\text{NO}_3)_2$, the periodic decomp. of which causes periodicity in the velocity of dissolution of the Fe. R. T.

Potentiometric methods for predicting corrosion of ferrous alloys.—See B., 1937, 351.

Kinetics of dissolution of calcium carbonate. V. M. GORTIKOV and L. I. PANTELEEVA (J. Gen. Chem. Russ., 1937, 7, 56—64).—The velocity of dissolution of CaCO_3 in dil. aq. $\text{HCl} \propto p_{\text{H}}$ and rate of stirring, and in aq. AcOH also to the $[\text{AcOH}]$. In aq. CO_2 the velocity approaches a const. max. val. with increasing rate of stirring, determined by the velocity of the reaction $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3$. R. T.

Velocity of dissolution of comminuted substances. III. W. JACEK (Rocz. Chem., 1937, 17, 64—72; cf. this vol., 88).—A simplified form of the previously derived equation is given. R. T.

Rate of reaction of magnesium with acids in ethyl alcohol. M. SCLAR and M. KILPATRICK (J. Amer. Chem. Soc., 1937, 59, 584—593).—Mg displaces H_2 from EtOH without the intermediate formation of solvated H^+ . When Mg dissolves in EtOH -acid mixtures the main reaction is between Mg and EtOH . The rate of reaction depends on what portion of the measured surface of Mg is available for reaction. This is related to $[\text{OEt}']$ at the reaction interface, which is determined by the actual rate of reaction between Mg and EtOH and the rate of removal of OEt' by neutralisation and transport. E. S. H.

Kinetics of the substitution of copper and iron by metallic zinc in chloride solutions. A. S. SCHACHOV (J. Phys. Chem. Russ., 1936, 8, 525—537).—The velocity of deposition of Cu from CuCl_2 solutions and of Fe from FeCl_2 solutions, by Zn, has been measured at 25° and 60° . It is unimol.; the velocity coeff. increases with acidity and decreases on addition of ZnCl_2 . At 80° in acid solution, and in presence of CdCl_2 , the deposition of Fe is strongly accelerated and obeys a bimol. law. E. R.

Mechanism of the action of aqueous solutions of acids on metals. A. QUARTAROLI (Atti V Congr. Naz. Chim., 1936, 2, 466—511).—In the action of aq. acid solutions on metals the undissociated acid mols. take an active part as well as the H^+ ions. The action of the acid mol. is particularly manifested with more oxidisable metals, and it is considered that the acid reacts not directly with the metal itself, but with a film of oxide, which is continuously produced from the metal and H_2O . The rate of dissolution of metals in acids is discussed from this point of view. O. J. W.

Acid-base catalysis in gas reactions. I. Depolymerisation of paraldehyde. R. P. BELL and R. LE G. BURNETT (Trans. Faraday Soc., 1937, 33, 355—363).—The depolymerisation of paraldehyde vapour (I) is catalysed by HCl and HBr at $100\text{--}190^\circ$, $< 95\%$ being converted into MeCHO . The reaction occurs with reproducible velocity after the surface of the reaction vessel has become aged by contact with the reaction products. The course of each experiment is unimol. and the velocity coeffs. are

independent of the pressure of (I), and \propto the pressure of catalyst. The temp. coeff. of the reaction velocity is negative for HBr catalysis and has a low positive val. for HCl catalysis. The reaction is also catalysed by HI, HCO_2H , $\text{CHCl}_2\cdot\text{CO}_2\text{H}$, and moist SO_2 , but not by dry SO_2 or by AcOH . J. W. S.

cis-trans Rearrangement of ethylene compounds catalysed by molecular oxygen. B. TAMAMUSHI and H. AKIYAMA (Z. Elektrochem., 1937, 43, 156—157).—The activity of O_2 in catalysing the change of Me_2 maleate into Me_2 fumarate has been investigated between 100° and 195° . The change, which is accelerated by increasing the O_2 pressure, is attributed to the paramagnetic properties of O_2 . N_2 , which is diamagnetic, is much less active than is O_2 . C. R. H.

Heterogeneous-homogeneous catalysis: $\text{C}_2\text{H}_4 + \text{O}_2$. M. V. POLJAKOV and F. M. WEINSTEIN (J. Phys. Chem. Russ., 1936, 8, 576—583).—The production of the peroxide $\text{C}_2\text{H}_4\text{O}_2$, by explosion and by slow catalysed reaction of C_2H_4 with O_2 at low temp., has been measured in relation to pressure and the relative concn. of C_2H_4 and O_2 . The curves obtained show that the same laws apply to both kinds of reaction. This supports the assumption of a common mechanism of heterogeneous and of volume-reactions, as developed previously for the oxidation of H_2 (cf. A., 1935, 588). E. R.

Heterogeneous-homogeneous catalysis: $\text{CH}_4 + \text{O}_2$. M. V. POLJAKOV, P. M. STADNIK, and I. E. NEIMARK (J. Phys. Chem. Russ., 1936, 8, 584—586).—The production of a peroxide in the catalytic oxidation of CH_4 is proved, and its yield measured in relation to the relative concn. of CH_4 and air. The results are considered as giving support to the theory of a unique mechanism of catalysed and explosive oxidation (see preceding abstract). E. R.

Active iron. XI. Catalysis by ferric salts in the systems oxalic acid-hydrogen peroxide and oxalic acid-mercuric chloride-hydrogen peroxide. A. SIMON and T. REETZ (Z. anorg. Chem., 1937, 231, 217—237; cf. A., 1936, 950).—Data are recorded for the rate of oxidation of $\text{H}_2\text{C}_2\text{O}_4$, $(\text{NH}_4)_2\text{C}_2\text{O}_4$, and $\text{Na}_2\text{C}_2\text{O}_4$ by H_2O_2 in presence of FeCl_3 . The reaction is catalysed by daylight and by the walls of the containing vessel. The catalytic action of FeCl_3 decreases as the p_{H} decreases, due to diminution in the $[\text{HO}_2']$. The autocatalytic effect in the reaction is due to increase in p_{H} . Addition of NaHCO_3 produces the same effect. The $[\text{Fe}^{III}]$ in the solution increases as the reaction proceeds. In presence of HgCl_2 , HgCl is pptd. at $p_{\text{H}} > 2$. The rate was measured in this case. Glyoxylic acid was detected as an intermediate in the oxidation. Reaction mechanisms involving HO_2 , formed in the process $\text{HO}_2' + \text{Fe}^{III} = \text{HO}_2 + \text{Fe}^{II}$, are discussed. H. J. E.

Reaction between hydrogen peroxide and phosphorous acid induced by ferrous salts. K. NERZ and C. WAGNER (Ber., 1937, 70, [B], 446—449).—When acidified Fe^{II} solution is gradually added to a mixture of H_3PO_3 , H_2O_2 , and H_2SO_4 in absence of air, the amount of H_2O_2 which enters into

reaction at first increases almost \propto the amount of added Fe^{II} and then attains a max. If the amount of H_2O_2 is const., the reaction does not depend greatly on the amount of H_3PO_3 if it is in large excess; with a very small excess the reaction is less extensive. With a const. excess of H_3PO_3 less reaction takes place initially with greater than with smaller amounts of H_2O_2 . In absence of air, H_2O_2 appears to assume the predominant role in rupture of the chain but the exact mechanism is not explained. More rapid addition of Fe^{II} induces less reaction; this involves increased concn. of the chain carriers and greater possibility of their mutual destruction (e.g., $\text{Fe}^{II} + \text{Fe}^{III} \rightleftharpoons 2\text{Fe}^{IV}$). In presence of air the graph of the decomp. of H_2O_2 as function of the amount of Fe^{II} assumes an S form whilst passage of O_2 nearly inhibits reaction even in presence of much Fe^{II} . The chain is therefore readily broken by O_2 . H. W.

Reaction between nitric acid and tin in presence of catalysts. I. G. S. KASBEKAR and A. R. NORMAND (Proc. Indian Acad. Sci., 1937, 5, A, 115—123).— FeSO_4 and FeCl_3 retard the reaction between Sn and HNO_3 , and cause an increase in the yield of NH_3 and a decrease in that of NH_2OH . The reaction is retarded by NaNO_2 and unaffected by $\text{CO}(\text{NH}_2)_2$, indicating that no HNO is formed in the reaction. H_2SO_4 and TiCl_3 retard the reaction at lower concns., but accelerate it at higher concns., with increase in the yields of NH_3 and NH_2OH . The reaction is unaffected by glucose. NaNO_3 , NaHSO_3 , Na_2SO_3 , and NaCl all retard the reaction, but NH_4Cl does not affect it. J. W. S.

Acid catalysis in liquid ammonia. A. I. SCHATTENSTEIN (J. Amer. Chem. Soc., 1937, 59, 432—435; cf. A., 1936, 1075; this vol., 191).—Ammonolysis of santonin, desmotroposantonin, and Et tartrate is also catalysed by phenols and carbohydrates. The order of catalytic activity of carboxylamides in liquid NH_3 corresponds with that of the acids in H_2O : $\text{AcOH} < \text{BzOH} < \text{HCO}_2\text{H}$. E. S. H.

Kinetics of the thermal isomerisation of cinnamic acid catalysed by iodine. R. G. DICKINSON and H. LOTZKAR (J. Amer. Chem. Soc., 1937, 59, 472—475).—Reaction rates have been determined in C_6H_6 solution at 99.4° and 122.5° . The rates, which are of first order with respect to *cis*-cinnamic acid and half-order with respect to I, indicate that the catalytic agent is the I atom as in the photochemical reaction. By comparison of the temp. coeffs. of the thermal and photochemical reactions the energy of dissociation of I_2 into I in C_6H_6 solution is calc. as 38,800 g.-cal., which agrees fairly well with the val. for the dissociation of I_2 vapour at 18° , calc. from spectroscopic data. E. S. H.

Decomposition of acetaldehyde catalysed by bromine.—See A., II, 176.

Catalytic isotope exchange between water and oxygen. N. MORITA and T. TITANI (Bull. Chem. Soc. Japan, 1937, 12, 104—106; cf. this vol., 41).—Complete exchange of O isotopes between gaseous O_2 and H_2O occurs when a mixture of O_2 and H_2O vapour is passed slowly over Pt-black heated above

540°. A slight exchange is detectable at 300°. Heated CuO , Fe_2O_3 , and Ag_2O are ineffective.

F. L. U.

Study of chemical systems by observing changes in weight at linearly varying temperatures. I. P. VALLET (*Ann. Chim.*, 1937, [xi], 7, 298—366).—The dehydration of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ has been investigated by means of Guichard's method (cf. A., 1925, ii, 559) with a view of determining the influence of variations in the humidity of the air stream, in the rate of heating, and in the shape and size of the reaction vessel. Both powdered salts and single crystals were examined. The decomp. of the hydrates of CuSO_4 is catalysed by addition of the next lower hydrate. C. R. H.

[Catalytic] oxidation of ammonia to nitrous oxide.—See B., 1937, 341.

Amorphous and crystallised oxide hydrates and oxides. XXXII. Oxidation of potassium iodide by hydrogen peroxide in presence of ferric hydroxides. A. KRAUSE and Z. ERNST (*Ber.*, 1937, 70, [B], 443—446).—All Fe^{III} hydroxides (I) have an inductive action on the liberation of I from KI by H_2O_2 in neutral solution or at p_{H} 5.5—6.0. The I vals. are almost \propto to the amounts of (I); the concn. of KI is important whereas that of H_2O_2 has little influence. The amount of liberated I is characteristic for each type of (I) and is considered to be related to the activity of H in the OH groups of (I). The rapidity with which the change ceases is remarkable. KOH is adsorbed by most types of (I) but the change does not depend exclusively on this factor. I is not adsorbed. H. W.

Catalysis by fused substances. I. E. ADAMUROV (*J. Phys. Chem. Russ.*, 1936, 8, 621—622).—Polemical (cf. Steacio and Elkin, A., 1936, 685).

E. R.

Contact effects of glass and platinum on the dissolution of iron and steel in nitric acid of various concentrations. H. ENDÔ and H. KAWASÉ (*Sci. Rep. Tohoku*, 1936, 25, 755—770).—The dissolution of Fe in 45—55% HNO_3 at the points of contact with glass is due to interference by the glass with the periodic formation and breaking of the liquid film of $[\text{Fe}(\text{NO})](\text{NO}_3)_2$. Periodic dissolution of the Fe is due to the latter effect. No marked attack occurs on replacing glass by Pt. There was no local attack of the Fe in contact with glass in HCl. H. J. E.

Simultaneous dehydrogenation and dehydrogenation of alcohol by single and mixed catalysts. A. M. RUBINSTEIN and E. P. GRATSCHOVA (*J. Phys. Chem. Russ.*, 1936, 8, 725—735).— $\text{C}_5\text{H}_{11}\text{OH}$ between 350° and 530° gives chiefly H_2 and smaller amounts of C_5H_{10} , CO, CO_2 , and an acid. The relation (rate of dehydrogenation) : (rate of dehydration) is for $\text{Fe}_2\text{O}_3 > \text{ZnO} > \text{Cr}_2\text{O}_3 > \text{BeO}$; it is almost independent of the temp. for Fe_2O_3 and ZnO but decreases with increasing temp. for Cr_2O_3 and BeO. The latter catalysts cause a deposition of C; they consequently become mixed catalysts during the reaction.

J. J. B.

Catalytic reactions among complex molecules. H. S. TAYLOR (*Trans. Electrochem. Soc.*, 1937, 71,

Preprint 13, 133—139).—A review of experiments on catalytic interchange of D for H in C_2H_6 and C_3H_8 . Active Cu catalysts which would hydrogenate C_2H_4 at 0°, gave no reaction involving breaking of the C—C linking in C_2H_6 — H_2 mixtures up to 400°. This reaction took place readily on Ni at 170°. Cr_2O_3 gel gave no CH_4 from $\text{C}_2\text{H}_6 + \text{H}_2$ at <400°. PhMe in contact with active Ni at >200° yields C_6H_6 and xylene. On the same catalyst C_6H_6 and C_2H_4 at >180° yield PhEt. At >300° C_2H_6 and C_6H_6 give CH_4 and PhMe. H. J. E.

Role of oxygen in hydrogenation of ethylene on palladium. D. DOBITSCHIN and A. GELBART (*Acta Physicochim. U.R.S.S.*, 1937, 6, 95—104; cf. A., 1936, 1472).—Addition of 0.01—1.0% of O_2 to a H_2 — C_2H_4 mixture does not affect the rate of hydrogenation on sputtered films of Pd at about 20 mm. and room temp. The Pd can be activated by the reaction of CH_4 on its surface, which undergoes mechanical disintegration resulting in the formation of active centres. Neither O_2 nor H_2O takes part in catalytic hydrogenation on Pd. F. L. U.

Catalytic combustion of acetylene. W. DAVIES (*Phil. Mag.*, 1937, [vii], 23, 409—425; cf. A., 1935, 455; 1936, 571).—The combustion with air and O_2 of C_2H_2 and mixtures with H_2 and CH_4 on a Pt filament was investigated at temp. <1700°. Combustion of 0.5—2% C_2H_2 —air mixtures does not occur at <600°, but if air is replaced by O_2 , reaction commences at approx. 500°. The combustion of H_2 —air mixtures, which is normally initiated at approx. 200°, is inhibited by C_2H_2 until the temp. is raised to 600°, above which both the C_2H_2 and the H_2 react. Hence Pt cannot be used for the preferential catalytic combustion of H_2 in presence of C_2H_2 . It appears that C_2H_2 is adsorbed by Pt at room temp. and that reaction occurs only when it evaporates at such a rate that O_2 can gain access to the surface. CH_4 does not affect the conditions of combustion of H_2 or C_2H_2 , and the catalyst acts preferentially towards either of these gases mixed with CH_4 provided the temp. is not raised to the val. above which CH_4 reacts. A 2% C_2H_2 —air mixture reacts on a Ni filament at >600°, but a 10% H_2 —air mixture does not react at < approx. 1100°. Au, Ag, Cu, and Fe do not catalyse these combustions. J. G. A. G.

Amorphous and crystallised oxide hydrates and oxides. XXXI. Peroxidase properties of amorphous ferric hydroxides. Catalysed oxidation of formic acid by hydrogen peroxide. A. KRAUSE and M. GAWRYCHOWA (*Ber.*, 1937, 70, [B], 439—443).—The oxidation of HCO_2H by H_2O_2 in presence of Fe^{III} orthohydroxide (I) is a change of the first order. Since indefinite amounts of HCO_2H can be thus oxidised, the action of (I) is truly catalytic. It is not shown by goethite and is ascribed to the presence of OH groups with active H. H. W.

Catalytic combustion of formaldehyde on a platinum wire. W. DAVIES and R. SPENCE (*Proc. Leeds Phil. Soc.*, 1937, 3, 300—304; cf. A., 1936, 571).—For dil. CH_2O —air mixtures the rate of heating of the wire $\propto [\text{CH}_2\text{O}]$. For concn. 20—65%, explosion occurs after inception of the surface reaction.

Results for rich mixtures are complicated by simultaneous homogeneous oxidation, but when $[\text{CH}_2\text{O}]$ reaches 85% the heterogeneous reaction is suppressed. The presence of adsorbed O_2 is probably an essential condition for surface combustion. N. M. B.

Active oxides. CVI. Zinc oxides, formed by the thermal decomposition of various complex zinc oxalates, as catalysts in the methyl alcohol decomposition. G. F. HUTTIG and H. GOERK (Z. anorg. Chem., 1937, 231, 249—263; cf. A., 1936, 1474).—Comparative catalytic data for 14 specimens of ZnO , prepared from simple and complex Zn salts, are recorded. The activity varies considerably with the source of the ZnO ; e.g., ZnO from $\text{ZnC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ is a good catalyst, yielding mainly CO and H_2 , whereas $\text{ZnC}_2\text{O}_4 \cdot 2\text{MeOH}$ gives on ignition a poor catalyst, the chief product from which is HCO_2Me . Complex Zn oxalates with relatively firmly bound groups in the cation gave the best catalysts and produced a min. of secondary products. The structure of the various ZnO specimens used is discussed. H. J. E.

Catalytic reduction of ethylene chlorohydrin.—See A., II, 174.

Dehydrogenation of cyclohexane by sulphide and oxide catalysts.—See A., II, 181.

Catalysis in hydrocarbon chemistry. IV. Adsorption of hexane on catalysts. R. H. GRIFFITH and S. G. HILL. **V.** Promoter concentrations. **VI.** Conversion of phenol into benzene. **VII.** Carrier action and molecular size. R. H. GRIFFITH (Trans. Faraday Soc., 1937, 33, 405—407, 407—409, 409—412, 412—416).—IV. Activated adsorption occurs in many cases of adsorption of C_6H_{14} on various catalysts at 20—450°. Adsorption can lead to (a) decomp. with deposition of C through secondary reactions from adsorption of primary reaction products, (b) decomp. with loss of H_2 , (c) decomp. with loss of CH_4 , or (d) holding of the mol. without decomp. It is concluded that catalytic activity is always accompanied by adsorption, but the latter does not necessarily involve activity.

V. The concn. of other oxide promoter which gives the greatest activity to MoO_3 catalyst, reduced in H_2 at 500°, for decomp. of C_6H_{14} , lies between 4.3 and 4.6 at.-% for each of 8 oxides tested. It is concluded that the amount required is a function of the catalyst and not of the promoter. If the promoter is present as metal (Fe, Cu, Pb) the concn. is only half that required with an oxide. It is concluded and proved experimentally that no higher activity is obtained by adding a second promoter to the most active concn. of the first.

VI. The optimum concn. of promoter for conversion of PhOH into C_6H_6 with a MoO_3 catalyst reduced in H_2 at 440° is higher than for the reduction of C_6H_{14} . Especially with alkali oxides, compound formation occurs between the MoO_3 and added oxides, the compounds being undecomposed at 440°.

VII. It is concluded that the most active catalyst has not necessarily the largest no. of active centres. The addition of a carrier to a catalyst containing a large no. of active centres produces a lowering of activity at a concn. dependent on the size of the

T^* (A., I.)

reactant mol. This reduction is not due to compound formation with the catalyst. Such a carrier may produce an initial increase in activity by preventing sintering. Addition of a promoter produces a surface of type different from that of the pure catalyst. Change in activity of Cr_2O_3 catalyst occurs on reduction. J. W. S.

Electrolytic separation of hydrogen isotopes on a palladium cathode. A. FARKAS (Trans. Faraday Soc., 1937, 33, 552—559; cf. A., 1934, 1070, 1315).—The D content of gas evolved at a Pd cathode during electrolysis of a mixture of light and heavy water has been compared with that of the occluded gas. The separation factors found are $(\text{H/D})_{\text{occl.}}/(\text{H/D})_{\text{liq.}} = 6.6$, and $(\text{H/D})_{\text{evol.}}/(\text{H/D})_{\text{liq.}} = 4.4$. The factor 6.6 can be regarded as caused by establishment of the equilibrium $\text{MH} + \text{HDO} \rightleftharpoons \text{MD} + \text{H}_2\text{O}$ on the electrode (M), in agreement with the theory of Halpern and Gross (A., 1935, 1210). The difference between the two factors is attributed to a different rate of recombination of H and D atoms on the Pd. F. L. U.

Electrolytic preparation of heavy water. Relation between electric current density and isotopic separation coefficient. ANON. (J. Electrochem. Soc. Japan, 1935, 3, 127).—The c.d. had no effect on the separation coeff. in the electrolysis of 20% NaOH solution in 0.08% D_2O with Ni electrodes and a c.d. of 0.05—1.0 amp. per sq. cm.

CH. ABS. (e)

Deposition of small amounts of metal from large volumes of liquid by electrolysis. F. HERNLER and R. PFENIGBERGER (Mikrochem., Molisch Festschr., 1936, 218—223).—The liquid is passed slowly through two cells in tandem. 0.1 mg. of Cu may be deposited quantitatively from 1 litre of solution. J. S. A.

Use of crystals as calcium electrodes. H. J. C. TENDELOO (J. Biol. Chem., 1937, 118, 253—254).—A reply to criticism by Anderson (*ibid.*, 1936, 115, 323) of the method previously described (A., 1936, 443; see also A., 1936, 1479). F. A. A.

Electrolytic etching method for revealing microstructure of electrodeposited nickel. A. J. KROMBHOLOZ (Trans. Faraday Soc., 1937, 33, 511—512).—The Ni is anodically etched in a saturated EtOH solution of dimethylglyoxime containing a little dil. HCl, using a c.d. of 0.06—0.2 amp. per sq. cm. Cu used as a basis metal is not attacked, and pitting and rapid attack of the edges of the deposit are avoided. F. L. U.

Preparation of thin layers of titanium by an electrolytic method. M. HAISSINSKY and (MME.) H. EMMANUEL-ZAVIZZIANO (Compt. rend., 1937, 204, 759—761; cf. A., 1936, 1213).—The layers are prepared by electrodeposition from aq. $\text{Ti}(\text{SO}_4)_2$ solutions (p_{H} 1.2—1.6), containing 1.7—2 mg. of TiO_2 and 0.15 g. of Na_2SO_4 per c.c., using a c.d. of 15—20 milliamp. per sq. cm. Deposits are obtained with cathodes of Zn, Sn, or Pb, but not with Ni or Pt, deposition appearing to depend on a high H_2 overvoltage at the cathode. A. J. E. W.

Electrolytic preparation of magnesium persulphate. L. LI and K. PEI (Contr. Inst. Chem., Nat. Acad. Peiping, 1935, 2, 1—20).—A solution containing approx. 60% of MgS_2O_8 was prepared by electrolysing aq. MgSO_4 with Pt electrodes. The solid compound could not be isolated. An unglazed porcelain diaphragm must be used. The optimum anode c.d. was 70 amp. per sq. dm. Formation of H_2SO_5 is negligible. CH. ABS. (e)

Electrolytic preparation of ferrochromium.—See B., 1937, 355.

Amalgamation of platinum as an electrolytic process.—See B., 1937, 356.

Electrolytic fractionation of lithium isotopes. G. CHAMPETIER and P. REGNAUT (Bull. Soc. chim., 1937, [v], 4, 592—594).—No significant fractionation was effected by electrolysing LiCl , using a cathode of circulating Hg. E. S. H.

Metallic scandium. W. FISCHER, K. BRUNGER, and H. GRIENEISEN (Z. anorg. Chem., 1937, 231, 54—62).—Electrolysis of ScCl_3 dissolved in molten KCl-LiCl eutectic with a molten Zn cathode yields a 2% Sc-Zn alloy from which scandium is obtained by heating in a vac. at 1250° . Metal of 98% purity (containing Si 0.3—0.5, Fe 0.2—0.5%, and Sc_2O_3) has m.p. about 1400° and d 3.1. F. L. Ü.

Continuous automatic control of acidity in the electrolytic preparation of persulphates.—See B., 1937, 360.

Electrolysis of salts in anhydrous glycerol. M. CENTNERSZWER and J. SZPER (Bull. Acad. Polonaise, 1936, A, 378—381).—The electrolysis between Cu electrodes of solutions of CuCl_2 , ZnCl_2 , and MgCl_2 in anhyd. glycerol (I) has been investigated, at temp. from 90° to 140° . In all cases Cl_2 is liberated at the anode and reacts to form CuCl_2 . When the anode is covered with a layer of CuCl_2 the Cl_2 reacts with (I). At the cathode H_2 is liberated and metallic glycerates $\text{C}_3\text{H}_6\text{O}_3\text{M}$ are formed [probably $\text{OH}\cdot\text{CH}(\text{CH}_2\cdot\text{O})_2\text{M}$], where M is metal atom. These compounds are colourless and insol in H_2O and org. solvents. When heated they decompose before melting. They are hydrolysed by hot H_2O and by acids. The yield by the current at the anode and cathode is approx. 100%. O. D. S.

Kolbe's electrochemical synthesis in deuterium oxide. H. ERLÉNMEYER and W. SCHOENAUER (Helv. Chim. Acta, 1937, 20, 222—223).—When KOAc in D_2O is electrolysed the C_2H_6 produced contains scarcely any D. E. S. H.

Electrochemical oxidation of copper lactate.—See A., II, 175.

Electrolytic reduction of maleimide and pyrrolidine.—See A., II, 165.

Role of ions in gaseous chemical reactions in electrical discharge. N. I. NEKRASSOV (J. Phys. Chem. Russ., 1936, 8, 736—755).—Theoretical. Reactions in the glow discharge are not initiated by ions, but mols. attracted to ions (clusters) are more easily activated than free mols. (cf. Thomson, A., 1924, ii, 222). J. J. B.

Reactions of oxygen and hydrogen at low pressures. W. H. RODEBUSH (J. Physical Chem., 1937, 41, 283—291).—H atoms with O_2 in the electrodeless discharge give H_2O_2 , but O atoms do not react with H_2 . It is supposed that this reaction occurs on the glass wall and no homogeneous reaction was observed. At atm. pressure O_2 reacts rapidly only with paramagnetic mols. (cf. Pauling and Coryell, A., 1936, 616). F. R. G.

Mechanism of the photo-reduction of ferric chloride dissolved in alcohols. M. PRASAD, B. V. MOHILE, and K. D. NIGUDKAR (J. Univ. Bombay, 1936, 5, Part II, 142—150).—Published work is discussed. E. S. H.

Formation of hydrogen fluoride from its elements, and absorption of light by fluorine. M. BODENSTEIN and H. JOCKERSCH [with S. H. CHONG] (Z. anorg. Chem., 1937, 231, 24—33).— H_2 and F_2 scarcely react at pressures about 100 mm. in Mg vessels at or below room temp., nor is combination induced by light from a quartz Hg vapour lamp. If Cl_2 is substituted for F_2 the gases combine very slowly. In Pt vessels H_2 and F_2 unite explosively at room temp., but very slowly at -80° . Illumination does not increase the velocity. The results are interpreted as showing that the reaction depends, as with Cl_2 and Br_2 , on the production of atoms, and that the reaction chains are readily broken at suitable surfaces. The heat of dissociation of F_2 is calc., from fresh measurements of the ultra-violet absorption spectrum, to be 70 kg.-cal. F. L. Ü.

Photographic latent image considered from the standpoint of the quantum mechanics model of crystals. J. H. WEBB (Phot. J., 1937, 77, 142—158).—A detailed discussion is given of the new view of electronic energy levels applied to crystals as a whole, and not to their atoms, as a basis for the explanation of photographic processes; the explanations are still very hypothetical. Broadly speaking, ripening of the emulsion produces U-centres in Ag halides, which act as a source of electrons to be lifted to upper F levels, by exposing light quanta; the U and F levels are discrete energy levels a little above the lower filled zone and a little below the upper empty level respectively, these latter being the allowed energy zones. The results obtained with alkali halides are compared. The hypotheses are to a large extent in agreement with the concn.-speck hypothesis of sensitivity, and even sensitising dyes may perhaps be considered as impurities causing irregularities in the crystal lattice. These hypotheses afford little explanation, however, of reversal and reciprocity-law failure; the latter, at high intensities, is considered to be related to the Demer photo-effect, producing a deep-seated, undevelopable latent image. J. L.

Critical number of quanta in photography. II. Polydisperse emulsion. S. P. SCHUVALOV (J. Phys. Chem. Russ., 1936, 8, 514—524).—The discussion already given (this vol., 193) for a mono-disperse layer is generalised for emulsions containing grains of different size. E. R.

Photochemical reduction with X-rays and effects of addition agents. G. L. CLARK and W. S. COE (J. Chem. Physics, 1937, 5, 97—105).—Reduction of inorg. compounds by X-rays has been studied quantitatively and an accurate method of determining oxidising substances, particularly $\text{Ce}(\text{SO}_4)_2$ in dil. H_2SO_4 , with *o*-phenanthroline as indicator is developed. The % reduction \propto the amount of irradiation and is independent of the salt concn. The catalytic or inhibitory properties of added substances are apparently quite arbitrary; e.g., AgClO_4 and AgNO_3 decrease and $\text{Hg}(\text{NO}_3)_2$ and AcOH increase the amount reduced. The effect may be due either to a catalytic process or to direct interaction of the substance with the inorg. salt under the influence of the rays. X-Ray reduction of KMnO_4 produces either MnO_2 or Mn^{++} , depending on the concn. and p_{H} of the solution. The effects of added substances are similar to those for $\text{Ce}(\text{SO}_4)_2$. The reduction of KBrO_3 and KIO_3 has also been studied. A suggested mechanism for the process involving (a) formation of H_2O_2 and (b) direct action of activated H_2O mols. is advanced. W. R. A.

Photochemical antagonism of radiations. G. HOLST (Nature, 1937, 139, 285).—An example of the power of light of different λ to shift the equilibrium of a thermal oxidation-reduction system of the type $A + \text{BH}_2 \rightleftharpoons \text{AH}_2 + B$ is described and discussed. The system consists of methylene-blue (A)—leucomethylene-blue (AH_2) and phenylhydrazinesulphonate (BH_2)—benzenediazosulphonate (B) in dil. acid solutions, the photo-active absorption of AH_2 and BH_2 being situated in the near and in the middle ultra-violet, respectively. L. S. T.

Photochemistry of polyatomic molecules containing alkyl radicals. IV. Mercury dimethyl. J. W. LINNETT and H. W. THOMPSON (Trans. Faraday Soc., 1937, 33, 501—507).—The photochemical decomp. of HgMe_2 vapour by light of λ 2537 Å. yields Hg and a mixture of hydrocarbons, mainly C_2H_6 . The quantum efficiency is approx. 1, and the facts are explained by assuming that the primary action yields Hg and C_2H_6 without production of reaction chains, but a few radicals formed by the subsidiary processes yielding $\text{Hg} + \text{Me} + \text{Me}$, or $\text{HgMe} + \text{Me}$ may give rise to chains and subsidiary products. J. W. S.

Photo-decomposition of gaseous acetone. R. SPENCE and W. WILD (J.C.S., 1937, 352—361; cf. A., 1936, 1077).—The decomp. in ultra-violet light has been investigated at 0—60° chiefly with <165 mm. of COMe_2 . The products are C_2H_6 , CO, Ac_2 , and small proportions of CH_4 , the main net reaction being $(2y - x)\text{COMe}_2 = y\text{C}_2\text{H}_6 + x\text{CO} + (y - x)\text{Ac}_2$. In the region of continuous absorption (I), the primary process is $\text{COMe}_2 + h\nu \rightarrow \text{Me} + \text{Ac}$, but Ac_2 is found in the products only at the lower temp. since Ac is decomposed instantly at 60°; the ratio $r = \text{C}_2\text{H}_6/\text{CO}$ is increased by increasing $[\text{COMe}_2]$, decreased by raising the temp., and rises to approx. 2.5 as the light intensity, L , is increased. With unfiltered Hg-light (II), r rises with L to approx. 1.9 and then approaches 1.5 at high L . The process in the region of discrete absorption, $\text{COMe}_2 + h\nu$

$\text{COMe}_2^* \rightarrow \text{C}_2\text{H}_6 + \text{CO}$, may not involve free radical formation; r is approx. unity, but the decomp. in this region is too small to explain the decrease of r when (II) replaces light corresponding with (I). The gaseous products from 860 mm. of COMe_2 at 60° contained 14—28% of CH_4 (cf. A., 1934, 1184). Reaction schemes consistent with the data are developed. J. G. A. G.

Photochemical behaviour of the aldehydes. G. K. ROLLEFSON (J. Physical Chem., 1937, 41, 259—265).—An interpretation of the results of Blacet and Roof (A., 1936, 437). F. R. G.

Reaction of dichromate with formate in light. H. AMMANN-BRASS (Z. wiss. Phot., 1937, 36, 33—48, 49—58).—The photo-reduction of dichromate with a buffer-mixture of formate and HCO_2H produces only Cr^{III} and CO_2 at $p_{\text{H}} < 4$ (reaction takes place in the dark at $p_{\text{H}} < 2.5$). From $p_{\text{H}} 2.5$ to 4.5, there is a linear relation between the reaction velocity and the HCO_2^- ion, for any given const. concn. of the latter, which is independent of the dichromate concn. and of temp. The p_{H} is a secondary factor, being only an indication of the HCO_2^- concn. Above $p_{\text{H}} 4.0$, the reaction proceeds in stages, forming chromic chromate (1 Cr^{IV} : 2 Cr^{III}) of basic formula $(\text{CrO}_2)_n$. Of various heavy-metal ions investigated, only Fe^{II} or Fe^{III} increases the reaction velocity (the effect increasing as reaction proceeds), and Ce^{III} retards reduction. Addition of fairly high concns. of MgSO_4 (i.e., a neutral salt) increases the velocity, and the results, by Bronsted's theory, tend to show that the action of light is first to produce a neutral mol. (CrO_3) which secondarily oxidises the formate. The quantum yield is about 1/10 for a formate concn. of 4 mol. per litre. Whilst max. reduction velocity of dichromate is at $p_{\text{H}} 4.5$, that for molybdate is at $p_{\text{H}} 2.5$; for a mixture, the final reaction product is the reduced Cr, and reaction is accelerated three times. This is due to re-oxidation of reduced molybdate by dichromate. J. L.

Photochemistry of some aliphatic nitroso-compounds. D. L. HAMMICK and M. W. LISTER (J.C.S., 1937, 489—493; cf. A., 1936, 37).—The photochemistry of $\text{CMe}_2\text{Cl} \cdot \text{CMe}_2\text{NO}$ (I), 1-chloro-1-nitrosocyclohexane, $\text{CMeBu}^i\text{Cl} \cdot \text{NO}$, and $\text{NO}_2 \cdot \text{CMe}_2\text{NO}$ in C_6H_6 , CHCl_3 , MeOH , and EtOH has been studied. It is very probable that the primary process is the elimination of the radical NOH with formation of an olefine, which then enters into subsequent reactions. The rate of photolysis \propto light intensity, and the quantum efficiency is in the neighbourhood of 1. The photolysis of (I) is unaffected by the presence or absence of O_2 , but in the other cases photo-oxidation occurs. A. J. M.

Oxidation of rubrene in light. W. KOBLITZ and H. J. SCHUMACHER (Z. physikal. Chem., 1937, B, 35, 11—24; cf. A., 1934, 977).—The photo-oxidation in $\text{C}_5\text{H}_5\text{N}$ and C_6H_6 solutions has been investigated. A reaction scheme, the principal features of which are the following, is advanced to account for the results. A rubrene mol. excited by light, R^* , is not capable of forming a stable RO_2 mol. by collision with an O_2 mol.; it must first

collide with another R mol. to give an R* mol. capable of oxide formation. An R- mol. may, however, form with O₂ an unstable RO₂ mol., which can be stabilised by collision with another R mol. The mean life of R- and R* is 10⁻⁹—10⁻⁷ sec. Neither excited O₂ mols. nor long-lived excited R mols. (cf. A., 1936, 1570) play any material part in the reaction. The quantum yield in C₆H₆ is > in C₅H₅N. R. C.

Photochemical addition of hydrogen peroxide to the double linking.—See A., II, 175.

Synthesis of sodamide from its elements, and its thermal decomposition. II. Thermal decomposition. K. SAKURAZAWA and R. HARA (J. Soc. Chem. Ind. Japan, 1937, 40, 10B; cf. J.C.S., 1894, 65, 504; A., 1921, ii, 334).—NaNH₂, prepared either from its elements with an Fe, or from Na and liquid NH₃ with a Pt, catalyst, decomposed in an evacuated steel vessel at 330—400° thus: NaNH₂ = NaH + 0.5H₂ + 0.5N₂, some NH₃ being formed, probably by the reaction NaNH₂ + H₂ = NaH + NH₃. The reaction became NaNH₂ = Na + H₂ + 0.5N₂ when the pressure was kept below the decomp. pressure of NaH, which pressure was determined in the range 330—400° and found to agree with the data of Keyes (A., 1912, ii, 627). The decomp. pressure of NaNH₂ at 400° was approx. 6.4 atm. R. C. M.

Products obtained by the reducing action of metals on salts in liquid ammonia solution. IV. Action of potassium and sodium on silver salts. V. Action of calcium on silver salts. W. M. BURGESS and F. R. HOLDEN (J. Amer. Chem. Soc., 1937, 59, 459—462, 462—463; cf. Chem. Rev., 1931, 8, 265).—IV. Na and K reduce Ag salts to Ag in liquid NH₃ solutions. The reduced Ag may catalyse the reaction between the alkali metal and NH₃, especially with K. With AgCNS the CNS radical is partly reduced, but with AgCNO the CNO radical is stable.

V. Ca reduces Ag salts to Ag in liquid NH₃ solutions. The reduced Ag is pyrophoric and catalyses the reaction between Ca and NH₃. In Ag salts the CNS radical is reduced completely and the CNO radical partly. E. S. H.

Reciprocal reaction between chlorides. G. AJON (Atti V Congr. Naz. Chim., 1936, 1, 255—271).—The pptn. of NaCl and of KCl from aq. solution by the addition of CaCl₂, either in solution or in the solid state, has been studied. NaCl is pptd. more readily than KCl. The ionic equilibria in these solutions are discussed. O. J. W.

Preparation and properties of caesium and rubidium sulphide, selenide, and telluride. A. BERGMANN (Z. anorg. Chem., 1937, 231, 269—280).—The prep. of Cs₂S, Cs₂Se, Cs₂Te, Rb₂S, Rb₂Se, and Rb₂Te from the elements in vac. is described. Polysulphide formation is minimised by using HgS instead of S. The temp. of incipient thermal decomp. in vac. were 510—520°, 660°, 680°, 530°, 690°, and 640°, respectively. Data for the electrical conductivity of Cs₂S, Cs₂Se, and Cs₂Te containing Cs are given. The temp. coeff. was positive. The metal atoms enter the lattice of the compound. H. J. E.

Amides of [elements of] groups I and II. I. Metal amides. R. JUZA (Z. anorg. Chem., 1937, 231, 121—135).—A general survey of heats of formation, physical properties, and constitution of the metal amides is given. F. L. U.

Optical research of thin [metal] layers. L. S. ORNSTEIN and P. J. HARINGHUIZEN (1st Internat. Electrodep. Conf., 1937, 4 pp.; cf. A., 1935, 1310).—The corrosion of evaporated and electrodeposited layers of Cu on glass due to immersion in heated transformer oil and in olive oil, at room temp., has been measured by determination of the light absorption of the layers. Both layers give the same order of corrosion, but measurement for evaporated layers is much more sensitive and accurate. A. J. K.

Precipitation of copper sulphate by sodium carbonate. M. GELOSO and (MLLE.) E. GIORDANO-ORSINI (Compt. rend., 1937, 204, 588—590).—The ppt. obtained on adding Na₂CO₃ to aq. CuSO₄ solution has the composition SO₃.4CuO.xH₂O. This is confirmed potentiometrically if atm. CO₂ is excluded. A. J. E. W.

Sodium cupricyanurate: two differently coloured forms of the anhydrous salt. New specific reaction for cyanuric acid. A. OSTROGOVICH and G. OSTROGOVICH (Atti V Congr. Naz. Chim., 1936, 2, 431—436).—The hydrated salt has the composition [Cu(C₃N₃O₃H₂)₄]₂Na₂.6H₂O (cf. A., 1914, i, 150). The anhyd. salt can exist in two forms, a violet α-form and a steel-blue β-form (stable only at <150°). The formation of this insol. complex salt by the addition of a few drops of dil. Cu(OAc)₂ or CuSO₄ to a cooled solution of (HCNO)₃ in 25—30% NaOAc forms a sensitive test for (HCNO)₃. O. J. W.

Compounds of magnesium chloride with organic compounds. Compounds with magnesium acetate and ethyl acetate. (MLLE.) M. L. QUINET (Bull. Soc. chim., 1937, [v], 4, 518—522).—AcOH combines with MgCl₂ at room temp. forming MgCl₂.6AcOH and MgCl₂.4AcOH. In boiling AcOH the product is Mg(OAc)₂.1.5AcOH. In vac. at 100° the product is Mg(OAc)₂ with HCl and AcOH; under other conditions this mixture may yield 3MgCl₂.Mg(OAc)₂ or MgCl₂.3Mg(OAc)₂. MgCl₂ and EtOAc react slowly at room temp. forming MgCl₂.3EtOAc, which decomposes under reduced pressure into MgCl₂.EtOAc. E. S. H.

Silicates. V. Nature of reaction products of pyrophyllite with molten magnesium and cobalt chlorides. E. THILO and H. SCHUNEMANN (Z. anorg. Chem., 1937, 230, 375—380; cf. this vol., 206).—The products are MgO.Al₂O₃.2.5SiO₂ + SiO₂ and CoO.Al₂O₃ + SiO₂, respectively. E. S. H.

Double compounds of carbamide with magnesium nitrate and magnesium sulphate. J. Y. YEE, R. O. E. DAVIS, and S. B. HENDRICKS (J. Amer. Chem. Soc., 1937, 59, 570—571).—The prep. of MgSO₄.5CO(NH₂)₂.2H₂O, MgSO₄.6CO(NH₂)₂.2H₂O, and Mg(NO₃)₂.4CO(NH₂)₂.2H₂O is described. Optical and X-ray data have been determined. E. S. H.

Reactivity of zinc amalgams. H. A. LIEBHAF-SKY (J. Amer. Chem. Soc., 1937, 59, 452—453).—

When violently agitated with different oxidising solutions, the rate of oxidation of Zn amalgam is limited mainly by the rate at which a fresh surface can be exposed; when this is const., the rate of oxidation increases slightly with concn. of amalgam, \propto the concn. of oxidising agent, and is almost unaffected by change of temp. The reaction appears to involve the capture of electrons by the oxidising agent at the surface of the Zn amalgam, followed by the expulsion of Zn^{++} . Conc. Zn amalgams appear to be inert only because the amount of Zn disappearing from them is proportionally small enough to escape detection.

E. S. H.

Influence of small quantities of metallic oxides on the crystallisation of zinc borate. R. PARIS and P. MONDAIN-MONVAL (Compt. rend., 1937, 204, 579—581; cf. A., 1936, 1079).—Alkali oxides accelerate crystallisation; oxides of group II metals have a weak retarding action. This is greater with other oxides (except PbO). The effect does not increase linearly with the content of added oxide. Ce, U, and W oxides are more effective when partly reduced.

A. J. E. W.

Tetrahydrate of zinc sulphate. P. VALLET (Compt. rend., 1937, 204, 496—497; cf. A., 1934, 859; 1935, 308).— $\text{ZnSO}_4 \cdot 4\text{H}_2\text{O}$ was obtained by controlled heating of $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$.

A. J. E. W.

Preparation and hydration of $\text{CaO} \cdot \text{Fe}_2\text{O}_3$ and $2\text{CaO} \cdot \text{Fe}_2\text{O}_3$. Y. SANADA (J. Soc. Chem. Ind. Japan, 1937, 40, 16B; cf. A., 1935, 1329).— $\text{CaO} \cdot \text{Fe}_2\text{O}_3$, formed from $\text{CaCO}_3 + \text{Fe}_2\text{O}_3$ at 1200° , does not hydrate, whilst $2\text{CaO} \cdot \text{Fe}_2\text{O}_3$, formed from $2\text{CaCO}_3 + \text{Fe}_2\text{O}_3$ at 1400° , reacts with H_2O thus: $2\text{CaO} \cdot \text{Fe}_2\text{O}_3 + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{CaO} \cdot \text{Fe}_2\text{O}_3$.

R. C. M.

Purification of mercury. K. KLEIN (Chem. Fabr., 1937, 10, 150—151).—Hg is atomised with compressed air as it flows from a dropping funnel and falls in a finely divided state into a washing solution, e.g., $\text{Hg}(\text{NO}_3)_2$ with HNO_3 . An overflow from the washing vessel leads into a similarly fitted H_2O vessel. The arrangement is safe, convenient, and yields a product equal to electrolytic Hg.

C. I.

Action of hydrogen sulphide on mercurous chromate. M. A. HAMID, V. S. BHATIA, and H. B. DUNNICLIFF (J. Indian Chem. Soc., 1937, 13, 697—699).—At 0° the ppt. contains $\text{Cr}_2(\text{SO}_4)_3$, $\text{Cr}_2(\text{SO}_4)_3$, $\text{Cr}_2(\text{S}_2\text{O}_3)_3$, $\text{Cr}(\text{OH})_3$, Hg_2S , and Above 60° the sulphite is quantitatively converted into sulphate.

D. C. J.

Active oxides. CIV. "Memory" of solid materials. G. F. HUITIG, E. ZEIDLER, and E. FRANZ (Z. anorg. Chem., 1937, 231, 104—120; cf. A., 1936, 1474).— Al_2O_3 prepared by heating the Al salts of various volatile acids has a relatively higher rate of dissolution in the acid from which it was prepared, when extraneous factors affecting the comparison are eliminated. Similarly, SrCl_2 prepared by heating $\text{SrCl}_2 \cdot 8\text{NH}_3$ combines with NH_3 more rapidly than with H_2O , whilst the converse is true of SrCl_2 prepared by heating $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$. Such influence of the previous history of a solid on its

chemical behaviour is not shown when, during its prep., it has undergone fusion.

F. L. U.

Rare earth metals. W. KLEMM and H. BOMMER (Z. anorg. Chem., 1937, 231, 138—171).—All the rare earth metals, except Ho, have been prepared by heating the chloride with an alkali metal. X-Ray spectra show them to have lattice structures to be expected from their relationship to neighbouring groups. The at. vol. curve shows sharp max. at Eu and Yb, and flat min. at Ce, Pr, and Tb. It is inferred from the at. vols., and confirmed by magnetic measurements, that several of the metals form bivalent and quadrivalent as well as trivalent ions. Ferromagnetism is observed only in Gd.

F. L. U.

Rare earth salts. Precipitation and p_H studies with the glass electrode. J. A. C. BOWLES and H. M. PARTRIDGE (Ind. Eng. Chem. [Anal.], 1937, 9, 124—127).—The order of basicity of the salts studied is $\text{Ce}^{IV} < \text{Th} < \text{Yb} < \text{Nd} < \text{Pr} < \text{Ce}^{III} < \text{La}$. When NaOH is added to the chlorides, the ppt. remains colloidal until a slight excess of NaOH has been added; pptn. occurs at a lower p_H in sulphate than in chloride solutions. Separation of rare earths (except Ce^{IV}) by fractional pptn. of hydroxides is impracticable. Ce^{IV} and La can be separated by controlling the p_H of the solution.

E. S. H.

Relations between cyanide, cyanamide, and nitride of some elements of the rare-earth group. A. PERRET and A. BANDERET (Compt. rend., 1937, 204, 586—588; cf. A., 1933, 229, 1252).—The yields of cyanamide and nitride obtained on heating NaCN with La, Ce, and Nd chlorides, with and without Fe powder, have been investigated. Low stability of a cyanamide is associated with a high affinity of the metal for N.

A. J. E. W.

Carbon suboxide. M. V. VOLKENSCHTEIN (Uspechi Chim., 1935, 4, 610—631).—A review.

CH. ABS. (e)

Products of reaction of sodium silicates with electrolytes. I. V. A. KARGIN, S. A. KATZ, and A. F. KOMOVSKI. **II.** V. A. KARGIN and S. A. KATZ (J. Appl. Chem. Russ., 1937, 10, 82—85, 86—92).—I. X-Ray and viscosity data do not suggest formation of alkaline-earth silicates when aq. MgCl_2 , CaCl_2 , or BaCl_2 is filtered through a mixture of SiO_2 and Na silicate.

II. Different titration curves of aq. Na silicate with $5N\text{-CaCl}_2$ are obtained, according to the initial SiO_2 gel content of the solutions. The results point to adsorption of $\text{Ca}(\text{OH})_2$ by SiO_2 gel.

R. T.

Reaction of concentrated solutions of sodium silicates with calcium chloride. V. A. KARGIN and S. A. KATZ (J. Appl. Chem. Russ., 1937, 10, 93—98).—A double membrane forms at the zone of contact of the solutions, consisting of SiO_2 gel with adsorbed $\text{Ca}(\text{OH})_2$ at the CaCl_2 surface, and of SiO_2 gel at the Na silicate surface.

R. T.

Titanium. VI. Mechanism of reaction, and products of chlorination of titaniferous materials. A. V. PAMFILOV and E. G. SCHANTDEL (J. Gen. Chem. Russ., 1937, 7, 258—261).—The reaction $\text{TiO}_2 + 2\text{Cl}_2 + \text{C} \rightarrow \text{TiCl}_4 + \text{CO}_2$ preponderates at $<600^\circ$, whilst the dominating reaction at $600\text{—}1000^\circ$

is $\text{TiO}_2 + 2\text{Cl}_2 + 2\text{C} \rightarrow \text{TiCl}_4 + 2\text{CO}$. The liquid chlorination products consist of TiCl_4 , SiCl_4 , and COCl_2 . R. T.

Reduction of stannic oxide by means of carbon monoxide. E. CREPAZ (Atti V Congr. Naz. Chim., 1936, 1, 346—352).—In the range 600—1000° the vals. of K for the equilibrium $\text{SnO}_2 + 2\text{CO} \rightleftharpoons \text{Sn} + 2\text{CO}_2$ are given by $\log K = 418.5/T - 0.9725$. Below 550° the process $\text{SnO}_2 + \text{CO} \rightleftharpoons \text{SnO} + \text{CO}_2$ takes place. O. J. W.

Chlorites. G. R. LEVI (Atti V Congr. Naz. Chim., 1936, 1, 382—386).—The compounds $\text{Pb}(\text{ClO}_2)_2$, PbCl_2 and $\text{Pb}(\text{ClO}_2)_2 \cdot \text{PbBr}_2$ have been prepared. The former is very stable. The reaction $\text{CaCO}_3 + 2\text{ClO}_2 + \text{H}_2\text{O}_2 \rightarrow \text{Ca}(\text{ClO}_2)_2 + \text{CO}_2 + \text{H}_2\text{O} + \text{O}_2$ is quant. The halogens react with solutions of chlorites to give halides and ClO_2 ; with Cl_2 this reaction is quant. O. J. W.

Preparation of acid ammonium sulphate $3(\text{NH}_4)_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$, usable in analysis. P. LATFETTE and P. LOCUTY (Ann. Chim. Analyt., 1937, [iii], 19, 61—63).— $(\text{NH}_4)_2\text{SO}_4$ (3 mols.) is dissolved in 30% H_2SO_4 (1 mol.), and cooled to 0°. $3(\text{NH}_4)_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$ crystallises, and may be washed at 0° with H_2O . Its use as an acidimetric standard is proposed. J. S. A.

Properties of ammonium nitrate.—See B., 1937, 339.

Phosphorus sulphobromide. A. E. VAN ARKEL and F. J. LEBBINK (Rec. trav. chim., 1937, 56, 208—210).—Action of Br_2 on a mixed CS_2 solution of P and S yields chiefly PSBr_3 , which has an X-ray diagram similar to that of CBr_4 and, contrary to statements in the lit., forms no hydrates. Attempts to obtain evidence of the existence of $\text{PSBr}_3 \cdot \text{PBr}_3$ (Annalen, 1873, 164, 36) have been unsuccessful. R. C.

Preparation of permonophosphoric acid. G. TOENNIES (J. Amer. Chem. Soc., 1937, 59, 555—557).— H_3PO_5 is prepared by interaction of P_2O_5 and H_2O_2 in MeCN. The solutions are relatively stable at room temp. The reaction does not occur appreciably when MeCN is replaced by Et_2O or isoamyl alcohol. E. S. H.

Bismuthdichloride, BiCl_2 . Existence, methods of formation, and properties. E. MONTIGNIE (Bull. Soc. chim., 1937, [v], 4, 588—591).— BiCl_2 may be prepared by direct synthesis, by reduction of BiCl_3 , or by interaction of Bi with Hg_2Cl_2 . BiCl_2 has m.p. 163°, and decomposes at 300° into BiCl_3 and Bi; it is a powerful reducing agent. E. S. H.

Permonosulphuric acid in organic media. G. TOENNIES (J. Amer. Chem. Soc., 1937, 59, 552—555).—The prep. of solutions of H_2SO_5 in EtOH, Pr^iOH , isoamyl alcohol, and MeCN is described. Slow decomp. occurs, but at -12° solutions containing $>0.6M$ H_2SO_5 are of convenient stability. Attention is directed to the possibility of explosive reactions with *sec.* and *tert.* alcohols, and with other org. solvents when $[\text{H}_2\text{SO}_5]$ is high. E. S. H.

Preparation and conservation of sodium tetrathionate. B. CACCIAVILLANI (Boll. Soc. ital. Biol.

sperim., 1936, 11, 754—756).—A modification of Sander's method (A., 1915, ii, 161, 629) yields a pure and relatively stable prep. F. O. H.

Chemistry in liquid sulphur dioxide. III. Thionyl thiocyanate and its "acidic" properties in pure sulphur dioxide solutions. G. JANDER and D. ULLMANN (Z. anorg. Chem., 1937, 230, 405—415; cf. A., 1937, II, 137).— $\text{SO}(\text{SCN})_2$ is formed in liquid SO_2 by interaction of NH_4SCN and SOCl_2 ; NH_4Cl is pptd. $\text{SO}(\text{SCN})_2$ reacts with $\text{K}_2\text{S}_2\text{O}_5$ in SO_2 , yielding KSCN and SO_2 . In these reactions SO^{++} behaves in an analogous way to H^+ in aq. solutions. The stability of the solutions is discussed. E. S. H.

Action of ethyl alcohol on aqueous solutions of potassium tellurate. M. PATRY (Compt. rend., 1937, 204, 497—500).—Addition of EtOH to aq. solutions of K_2TeO_4 causes separation into two phases. The denser, viscous phase is rich in EtOH and contains most of the Te; K : Te < 2. The effect is ascribed to hydrolysis of the K_2TeO_4 , with production of an acid tellurate which is more sol. in aq. EtOH than the neutral salt. Evaporation of the alcoholic phase gives successively a gel and an amorphous metatellurate. A. J. E. W.

Basic chromium sulphites. A. SCONZO (Atti V Congr. Naz. Chim., 1936, 2, 548—557).—When solutions of $\text{Cr}_2(\text{SO}_4)_3$ and Na_2SO_3 are boiled together SO_2 is evolved and basic sulphites are pptd. (except when the mol. ratio of the two reactants is 1 : 1). With a mol. ratio of 1 : 2 of the reactants the basic sulphite, after drying over fused CaCl_2 , has the composition $2\text{Cr}_2\text{O}_3 \cdot \text{SO}_2 \cdot 9\text{H}_2\text{O}$. When boiled with $\text{K}_2\text{Cr}_2\text{O}_7$ in H_2SO_4 only 7.11% of the SO_2 is oxidised. With an initial mol. ratio 1 : 3 or 1 : 5 the compound $3\text{Cr}_2\text{O}_3 \cdot 2\text{SO}_2 \cdot 14\text{H}_2\text{O}$ is obtained (58.96% of SO_2 oxidisable by $\text{K}_2\text{Cr}_2\text{O}_7$). By boiling a solution of $\text{Cr}(\text{OH})_3$ (pptd. in the cold) in aq. SO_2 the compound $\text{Cr}_2\text{O}_3 \cdot \text{SO}_2 \cdot 4\text{H}_2\text{O}$ is obtained (93.28% of SO_2 oxidisable), or if Na_2SO_4 has been added to the mixture before boiling $3\text{Cr}_2\text{O}_3 \cdot 2\text{SO}_2$ is pptd. O. J. W.

Relative and absolute spatial configuration of isomorphous optically active complex salts. II. Comparison of the tri-diamino-salts of cobalt, rhodium, and chromium. F. M. JAEGER (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 108—116; cf. this vol., 170).—Treatment of $[\text{Cr}(\text{C}_2\text{H}_5\text{N})_3\text{Cl}_3]$ with the respective bases yields the compounds $[\text{Cr}(\text{en})_3]\text{Cl}_3 \cdot \text{H}_2\text{O}$, $[\text{Cr}(\text{d-chxn})_3]\text{Cl}_3 \cdot 3\text{H}_2\text{O}$, and $[\text{Cr}(\text{d-cptn})_3]\text{Cl}_3 \cdot 3\text{H}_2\text{O}$ [en = $(\text{CH}_2 \cdot \text{NH}_2)_2$, chxn = cyclohexanediamine, cptn = cyclopentanediamine], isomorphous with the corresponding Co and Rh salts. They are resolvable through the chloro-*D*-tartrates, the less sol. salts yielding respectively the *D*-, *L*-, and *L*-forms. The less sol. chloro-*D*-tartrates also yield *L*-[Co(*d*-cptn) $_3$] $\text{Cl}_3 \cdot 3\text{H}_2\text{O}$ and *L*-[Rh(*d*-cptn) $_3$] Cl_3 from the corresponding racemates. The rotatory dispersions of these compounds are recorded and their relative spatial configurations are discussed. J. W. S.

Preparation of a source of pure polonium suitable for structural analysis by means of electron beam diffraction. M. A. ROLLIER (Gazzetta, 1936,

66, 797—808).—From the mixture of Ra-D, Ra-E, and Po, obtained from Ra, the Po is separated by a convenient chemical treatment. The Po is then electrodeposited on Ni and finally distilled in H_2 on to a collodion film. The crystal structure of Po was determined by electron diffraction: pseudo-hexagonal or monoclinic, 6 or 12 atoms per unit cell, a 4.254 Å., c/a 3.32, d_{calc} 9.39 (pseudo-hexagonal) or 9.24 (monoclinic); for d 9.39 the at. vol. = 8.95.

O. J. W.

Exchange reactions of iodine compounds. H. A. C. MCKAY (Nature, 1937, 139, 283—284).—Results obtained by Juliusburger *et al.* (A., 1936, 40) using the radioactive indicator method have been confirmed and extended. The MeI-NaI exchange has been carried out in both directions, *i.e.*, starting first with active NaI and then with active MeI. The exchange also occurs in alcohol in presence of SO_2 , showing it to be independent of traces of free I. Et, Pr ^{α} , Pr ^{β} , Bu, and *iso*amyl iodides exchange I with NaI at 100°. CH_2I_2 and CHI_3 also exchange with NaI at 100° in alcoholic solution. Certain aromatic compounds, such as PhI, p - $C_6H_4I \cdot NO_2$, and p - $C_6H_4I \cdot NH_2$, fail to exchange at 100°. In aq. solution $CH_2I \cdot CO_2H$ exchanges with NaI at room temp., but $CH_2I \cdot CH_2 \cdot CO_2H$ exchanges only on heating to the b.p. *m*- and p - $C_6H_4I \cdot CO_2H$ fail to exchange with NaI in $COMe_2$ solution. L. S. T.

Crystallised manganic sulphate. L. DOMANGE (Bull. Soc. chim., 1937, [v], 4, 594—597).—Good crystals of $Mn_2(SO_4)_3$ can be prepared by a modification of Franke's method (A., 1888, 229). E. S. H.

Preparation of highly dispersed iron. V. A. BAEV (Zavod. Lab., 1936, 5, 496—497).—Known methods are described. R. T.

Higher oxygen compounds of iron. I. B. PETROV and B. ORMONT (J. Phys. Chem. Russ., 1936, 8, 665—676).—The green K ferrate of Goralevitch (A., 1927, 433) was impure K_2MnO_4 .

J. J. B.

Influence of granule size of sodium peroxide on the process of fusion with ferro-silicon. E. L. ZAUBER and A. L. VOROBIEV (Zavod. Lab., 1936, 5, 671).—Sputtering or explosion of Fe-Si- Na_2O_2 mixtures during fusion is avoided by using finely powdered Na_2O_2 . R. T.

Preparation of ferrites by substitution of ferrous ions in magnetite. J. BENARD and G. CHAUDRON (Compt. rend., 1937, 204, 766—768).—On heating Fe_3O_4 with NiO or CoO, complete substitution of one atom of Fe by Ni or Co occurs, the corresponding ferrite being formed. With Mn and Cu substitution is incomplete, solid solutions being formed. Fe_3O_4 and ferrites probably contain a very stable O atom lattice, in which the metal atoms are loosely bound. A. J. E. W.

Double bromide of iron and ammonium. J. M. MERCIER (Compt. rend., 1937, 204, 500—502).— $NH_4[Fe^{II}Br_3] \cdot 6H_2O$ is formed by crystallising an aq. solution of 4 mols. of $FeBr_2$ and 1 mol. of NH_4Br . A ternary equilibrium diagram for the system $FeBr_2$ - NH_4Br - H_2O is given. A. J. E. W.

Cobaltic chloride. (MLLE.) D. HIBERT and C. DUVAL (Compt. rend., 1937, 204, 780—783).—Methods of prep. of $CoCl_3$ are discussed. Good yields are obtained by the action of HCl on Co_2O_3 in presence of Et_2O , at -5° , in the dark. The properties of the product are described. Below -60° the colour changes from green to pale yellow; the green compound is $Co[CoCl_6]$ (I), the yellow one probably $CoCl_3$. An Et_2O solution of (I) gives $Na_3[Co(NO_2)_6]$ on treatment with $NaNO_2$, and $[Co(NH_3)_6]Cl_3$ with NH_3 . A. J. E. W.

Determination of the number of interchangeable hydrogen atoms in complex salts. J. HORUTI and G. OKAMOTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 205—210).—Samples of $[Co(NH_3)_6]_2(SO_4)_3 \cdot 5H_2O$, $[Co(NH_3)_5NO_2]Cl_2$, $[Co(NH_3)_5H_2O]Cl_3$, and $[Co(NH_3)_4CO_3]Cl$ were treated with 99.6% D_2O and then with H_2O . All the H atoms in the complex salts were replaceable by D, or *vice versa*, in solution at room temp. H. J. E.

Complex salts of the racemic and optically active cyclohexanediamines with trivalent cobalt and rhodium. II. Complex tricyclohexanediamine-rhodium salts. F. M. JAEGER and L. BIKKERK (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 116—123; cf. this vol., 170).—The compounds $Rh(d\text{-}chxn)_3Cl_3 \cdot 3H_2O$ and $Rh(l\text{-}chxn)_3Cl_3 \cdot 3H_2O$ ($chxn$ = cyclohexanediamine) are obtained by boiling aq. Na_3RhCl_6 with the active cyclohexanediamine and $EtOH$. After separation of most of these compounds by crystallisation the residue can be pptd. as the iodide. On treatment with the appropriate Ag salts this yields the corresponding chloride, bromide, nitrate, and perchlorate. Crystallographic data for these compounds are recorded. The chlorides have been resolved through their bromo-*d*-tartrates, and their rotatory dispersions in racemic and resolved forms are recorded. J. W. S.

New type of complex formation of iridium. N. K. PSCHENICIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 293—294).— $(NH_4)_3[IrCl_6] \cdot NH_4NO_3$ (I) is formed by reaction in aq. solution between NH_4NO_3 and $(NH_4)_3IrCl_6$. (I) is analogous in its properties with Wilm's salt, $(NH_4)_3[RhCl_6] \cdot NH_4NO_3$, and dissociates into five ions in aq. solution. O. D. S.

Application of curved crystals to X-ray spectrum analysis. M. BLOCHIN (Zavod. Lab., 1936, 5, 439—447).—Known methods are discussed. R. T.

Magneto-optic method of analysis. D. C. BOND (J. Amer. Chem. Soc., 1937, 59, 439—444).—Evidence of the validity of the method has been obtained and the theoretical implications are discussed. E. S. H.

Importance of colour reactions in analytical chemistry. J. V. DUBSKY (Chem. Listy, 1937, 31, 84—88).—A review. R. T.

Structure of precipitates obtained in chemical analysis. I. I. P. ALIMARIN (J. Appl. Chem. Russ., 1937, 10, 171—183).—Tananaev's classification of ppts. as cryst. or amorphous is criticised. The influence of conditions of pptn. on the structure of ppts. is discussed. R. T.

Dilution method of hydrogen-ion concentration determination. II. J. McCRAE (J. S. African Chem. Inst., 1937, 20, 10—11; cf. A., 1935, 1336).—Improved colorimetric technique is described.

J. S. A.

Determination of p_H of natural waters. J. I. USATENKO and A. A. VOJTASCHIK (Zavod. Lab., 1936, 5, 436—438).—Colorimetric and potentiometric determinations of p_H confirm the validity of the formula $p_H = 7.719 + \log K/a$, where K is the H carbonate content, in ° German, of the H_2O , and a is the $[CO_2]$ in mg. per litre.

R. T.

Anhydrous sodium carbonate as a standard of reference in acidimetry. Stability of sodium carbonate in the temperature range 300—400°. G. F. SMITH and G. F. CROAD (Ind. Eng. Chem. [Anal.], 1937, 9, 141—142).— Na_2CO_3 which has been heated at 300° is suitable as a standard, but at slightly higher temp. decomp. with loss of CO_2 occurs.

E. S. H.

Standard solution for p_H measurements. A. K. AIROLA (Suomen Kem., 1937, 10, A, 29—34).—Measurements have been made with the solution recommended (this vol., 196), and corrections applied for diffusion potential and varying atm. pressure. An accuracy of $\pm 0.01 p_H$ is claimed.

M. H. M. A.

Micro- p_H measurements with quinhydrone. F. FUHRMANN (Mikrochem., Molisch Festschr., 1936, 130—146).—Apparatus and technique for electro-metric p_H measurement are described, using < 0.5 c.c. of liquid.

J. S. A.

Keeping properties of standard acids and alkalis. Use of copper bottles. J. LINDNER (Mikrochem., Molisch Festschr., 1936, 301—313).—Advantages of using Cu bottles as storage reservoirs for standard solutions are discussed.

J. S. A.

Micro-titration of very weak bases. J. MIKA (Mikrochem., Molisch Festschr., 1936, 319—337).—Weak bases which form stoichiometric non-volatile hydrochlorides of sufficient stability may be determined by evaporating them to dryness with HCl; the hydrochloride is then dissolved and titrated with alkali.

J. S. A.

Acidimetric determination of water with acid chlorides. C. J. VAN NIEUWENBERG (Chem. Weekblad, 1937, 34, 217).—Small quantities of H_2O (1—10 mg.) can be accurately determined by measuring acidimetrically the HCl liberated from cinnamoyl chloride.

S. C.

Rapid determination of small amounts of moisture in salts.—See B., 1937, 341.

Rapid determination of moisture in unbaked brick.—See B., 1937, 345.

Aromatic phosphorus halides and their suitability for the volumetric determination of water.—See A., II, 220.

Permanganometric determination of chlorates. S. S. SCHRAIBMAN and A. V. BALEEV (Zavod. Lab., 1936, 5, 425—427).—Standard $FeSO_4$ in $10N-H_2SO_4$ is added to the solution, and after 5 min. excess of Fe^{II} is titrated with $KMnO_4$. The $[H_2SO_4]$ of the reaction mixture should be $< 20\%$.

R. T.

Potentiometric titration of bromine and bromates by thiosulphate. R. CERNATESCU and R. RALEA (Ann. Sci. Univ. Jassy, 1935, 20, 118—128).—The potentiometric titration of Br, or of $KBrO_3$ after liberating Br, has been studied using $Na_2S_2O_3$, in presence of HCl and $(NH_4)_2MoO_4 : S_2O_3'' + 4Br_2 + 5H_2O = 2SO_4'' + 10H^+ + 8Br^-$. The min. wt. of $KBrO_3$ analysable is 0.073 mg., and 0.001N- $Na_2S_2O_3$ may be titrated with great accuracy.

R. S. B.

Titrimetric determination of small amounts of bromine in presence of chlorides. H. DOERING (Z. anal. Chem., 1937, 108, 255—258).—Br is oxidised to BrO_3' by means of NaOCl, the reaction being made quant. by neutralising the HCl formed by means of $CaCO_3$. The excess of NaOCl is removed by means of HCO_2Na at 100°, and the BrO_3' is determined iodometrically.

J. S. A.

Potassium iodide as a primary standard substance in permanganimetry. I. M. KOLTHOFF, H. A. LAITINEN, and J. J. LINGANE (J. Amer. Chem. Soc., 1937, 59, 429—432).—An accuracy of 0.05% can be obtained in standardising $KMnO_4$ against KI. KI and As_2O_3 are more suitable for standardising aq. $KMnO_4$ than is $Na_2C_2O_4$.

E. S. H.

Dioxan as a reagent for detection and determination of small amounts of iodide. Application to the detection of iodide in iodised salt. A. SAIFER and J. HUGHES (J. Biol. Chem., 1937, 118, 241—245).—Free I is liberated when iodides are warmed with dioxan in slightly alkaline solution, and then HNO_3 added. Colorimetrically, 0.1 mg. of I' can be determined, $\pm 3\%$; large amounts of certain other ions do not interfere.

F. A. A.

Analysis of fluorides. F. SPECHT (Z. anorg. Chem., 1937, 231, 181—191).—Details are given for the determination of F by pptn. as $PbClF$ and subsequent titration of the Cl with $AgNO_3$. Special directions are given for the analysis of cryolite and of org. compounds containing F, and for determination of H_2SiF_6 and H_2SO_4 in hydrofluoric acid.

F. L. U.

Determination and detection of fluoride ion with lanthanum. P. GIANMARINO (Z. anal. Chem., 1937, 108, 196—197; cf. A., 1936, 693).—Pptn. from cold solution with 2% $La(NO_3)_3$ in presence of $NH_4OAc + AcOH$ gives more accurate results than Meyer's method. Small amounts of F' may be so determined nephelometrically.

J. S. A.

Analysis of ozone, when very dilute, based on the catalytic action exerted by this gas in the oxidation of aldehydes. E. BRINER and E. PERROTTET (Helv. Chim. Acta, 1937, 20, 293—298).—The O_3 content of air is determined by the oxidation of solutions of $PhCHO$ in CCl_4 or of $PrCHO$ in hexane. Variations of $[O_3]$ of the order of 10^{-8} can be determined.

E. S. H.

Colour reaction between nitroprusside and sulphites (Bodeker's reaction). G. SCAGLIARINI (Atti V Congr. Naz. Chim., 1936, 2, 544—546; cf. A., 1934, 1189).—The compounds $Zn_2[Fe(CN)_5NOSO_3] \cdot 2(CH_2)_6N_4 \cdot 12H_2O$ and $Ni_2[Fe(CN)_5NOSO_3] \cdot 2(CH_2)_6N_4 \cdot 8H_2O$ have been pre-

pared. In the presence of H_2O they are intensely blood-red in colour, but in the dry state are dark reddish-violet.

Oxidation-reduction potential measurements show that in Bodeker's reaction the $[\text{Fe}(\text{CN})_5\text{NO}]''$ ion is transformed into the $[\text{Fe}(\text{CN})_5\text{NOSO}_3]'''$ ion.

O. J. W.

Potentiometric determination of sulphuric and persulphuric acids and hydrogen peroxide when present together. E. I. DENISOV (Trans. Leningrad Ind. Inst., 1936, No. 9, 40—46).—The end-point in Gleu's method (A., 1931, 326) is improved by use of a bimetallic W-Pt electrode. The time for determining H_2SO_5 is reduced by using dil. KBr.

G. H. C.

Detection of traces of sulphur in argon. I. I. STRISHEVSKI and I. V. KORABLEV (Zavod. Lab., 1936, 5, 591—592).—An A-steam mixture is heated at 800° , and the resulting gas is passed into a funnel wetted with aq. $\text{Pb}(\text{OAc})_2$; a brown stain indicates presence of S, SO_2 , or SO_3 in the A. Methods of determination are outlined.

R. T.

Areametric determination of small amounts of sulphate as barium sulphate. V. R. DAMERELL and P. SPREMULLI (Ind. Eng. Chem. [Anal.], 1937, 9, 123—124).—By measuring the area of BaSO_4 pptd. under controlled conditions, 0.01—4 mg. can be determined.

E. S. H.

Detection of sulphur in steel by the Baumann stain method.—See B., 1937, 352.

Volumetric determination of sulphur in pyrites.—See B., 1937, 340.

Chromatometric determination of tellurous acid in hydrochloric acid solution. Determination of antimonious acid or arsenious acid in presence of tellurous acid. R. LANG and E. FAUDE (Z. anal. Chem., 1937, 108, 258—266).—The liberation of Cl from $\text{H}_2\text{TeO}_3 + \text{K}_2\text{Cr}_2\text{O}_7$ in HCl solution is due to the induced oxidation of HCl, which is inhibited in presence of Mn^{++} or Ce^{+++} as acceptors. 0.5 equiv. of acceptor is thereby oxidised. Excess of $\text{K}_2\text{Cr}_2\text{O}_7$ is added and the excess of Mn^{+++} (or Ce^{+++}) is titrated back with FeSO_4 . In presence of Br^- , Ce is preferable as acceptor, and HPO_3 is added to inhibit induced liberation of Br during the back titration. $\text{As}^{III} + \text{Sb}^{III}$ are determined in presence of Te^{IV} by adding MnSO_4 , and titrating the solution, acidified with $\text{H}_2\text{SO}_4 + \text{HCl}$, with KIO_3 or KBrO_3 . Te is then determined by adding excess of $\text{K}_2\text{Cr}_2\text{O}_7$, as above. As alone may be titrated with $\text{Ce}(\text{SO}_4)_2$ at $45\text{--}55^\circ$ in presence of $\text{MnSO}_4 + 3\text{--}4$ drops of 0.002N- KIO_3 , with Fe-*o*-phenanthroline as indicator, Te being subsequently determined as before. Alternatively, As or Sb may be titrated at room temp. with $\text{Ce}(\text{SO}_4)_2$, 10 c.c. of 0.5N-KCN and 3 c.c. of 0.5M- ICl being added to the solution. J. S. A.

Characterisation and micro-determination of nitrates. M. LEMOIGNE, P. MONGUILLON, and R. DESVEAUX (Compt. rend., 1937, 204, 683—686).—Nitrates are reduced to nitrites with Zn at 0° , excess of Zn being separated. $p\text{-NH}_2\text{C}_6\text{H}_4\text{SO}_3\text{H}$, and a solution of I in AcOH, are added; excess of I is decomposed with $\text{Na}_2\text{S}_2\text{O}_3$, and $\text{C}_{10}\text{H}_7\text{NH}_2$ added. The resulting colour is compared with standards.

0.14 mg. per litre of N as NO_3' can be determined, and 0.01 mg. per litre detected.

A. J. E. W.

Colorimetric determination of nitrates. G. V. L. N. MURTY and G. GOPALARAO (Z. anorg. Chem., 1937, 231, 298—303).— $\alpha\text{-OH-C}_{10}\text{H}_6\text{SO}_3\text{H}$ produces with solid nitrates a compound which, on neutralisation with alkali, gives a persistent yellow colour, suitable for the colorimetric determination of NO_3' . NH_4' , Mg salts, and PO_4''' have no effect, but Cl' , CO_3'' , and NO_2' interfere. 0.05—1.0 mg. of N in the form of NO_3' may be determined in the residue after evaporating a solution to be examined.

H. J. E.

Separate determination of nitrogen oxides in the gases of Gay Lussac towers.—See B., 1937, 338.

Determination of certain elements with the spectrograph by arc process. II. K. KONISHI and T. TSUGE (J. Agric. Chem. Soc. Japan, 1937, 13, 162—171; cf. A., 1936, 695).—Over the range 0.2—8.0% P there is a linear relation between [P] and intensity of the lines. The calc. amounts of P in rice and wheat straw and in soya-bean leaves agree with those determined chemically. J. N. A.

Determination of phosphoric acid by weighing the molybdenum precipitate. G. JØRGENSEN (Z. anal. Chem., 1937, 108, 190—196; cf. this vol., 44).—The effect of the presence of Ca, SO_4 , SiO_2 , citric acid, etc. is discussed. Ca and SO_4 lead to high results.

J. S. A.

Determination of phosphorus in coal and coke.—See B., 1937, 311.

Determination of free arsenic trioxide in calcium arsenite.—See B., 1937, 340.

Determination of arsenic in ores and products.—See B., 1937, 340.

Determination of arsenic in gases.—See B., 1937, 341.

Apparatus for determining small amounts of carbon in steel by the baryta method.—See B., 1937, 352.

Determination of carbon in mild steel by magnetic analysis.—See B., 1937, 352.

Rapid determination of the carbon content of solid and liquid fuels.—See B., 1937, 311.

Analysis of carborundum and of refractory carborundum articles.—See B., 1937, 346.

Rapid determination of silicic acid and calcium oxide in copper slags.—See B., 1937, 352.

Determination of potassium by means of an aqueous solution of trisodium cobaltinitrite in presence of nitric acid. L. V. WILCOX (Ind. Eng. Chem. [Anal.], 1937, 9, 136—138).—Modified gravimetric and volumetric procedures are described. The accuracy is within ± 0.05 mg. of K. E. S. H.

Determination of sodium and potassium. C. S. PIPER (J. Proc. Austral. Chem. Inst., 1937, 4, 18—26).—The gravimetric determination of Na as triple uranyl acetate, especially by Kahane's method, and of K as K_2PtCl_6 or KClO_4 and by means of

$\text{Na}_3\text{Co}(\text{NO}_2)_6$ (I) are reviewed. The composition of the ppt. formed with (I) under standardised conditions varies continuously with the $[\text{K}]$, and reaches the limiting composition $\text{K}_2\text{NaCo}(\text{NO}_2)_6$ in presence of ≈ 93 mg. of K_2O . J. S. A.

Rapid indirect determination of sodium and potassium present together. S. I. MESCHALKIN (Zavod. Lab., 1936, 5, 422–424).—Na and K are separated from other elements as chlorides, which are weighed and dissolved in H_2O , and Cl^- is titrated in an aliquot part of the solution; the K and Na contents are hence calc. R. T.

Interferometric determination of potassium nitrate in black powder.—See B., 1937, 396.

Determination of silver by means of acetylene. I. I. STRISHEVSKI (Zavod. Lab., 1936, 5, 590–591).—5 ml. of 50% tartaric acid and 10 ml. of 10% NH_3 are added to 25 ml. of feebly acid solution, containing ≈ 0.01 g. Ag, at 60° , and pure C_2H_2 is passed for 15 min. The ppt. is collected, washed with saturated aq. C_2H_2 , boiled for 10 min. with 30 ml. of 25% HNO_3 , and the solution is titrated with standard NH_4CNS . R. T.

Performance of microchemical reactions. W. BOTTGER (Mikrochem., Molisch Festschr., 1936, 47–51).—The effects of the concn. of solutions on nucleus formation and deposition of ppts. of characteristic habit is discussed with reference to AgCl and MgNH_4PO_4 . J. S. A.

Qualitative micro-analysis by electrolysis and spectrography. Precipitation at the mercury electrode. A. SCHLEICHER and L. LAURS (Z. anal. Chem., 1937, 108, 241–247).—Cations are deposited electrolytically from 0.1 c.c. of solutions containing chlorides or bromides, on to a Hg electrode formed by electrolytic amalgamation of a pointed Cu wire. A Ag-plated Pt anode is used or, alternatively, $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ may be added to the solution as a depolariser. The cathode is subsequently used as an electrode for the interrupted arc discharge, and the spectrum examined between 3700 and 7300 Å. By control of the deposition voltage, Ca, Sr, Ba, Li, Na, Rb, and Cs may be detected and approx. determined. Zn, Mn, and Pb may be detected similarly with lower sensitivity. The sensitivity, for Ca etc., is 0.0001–0.001 mg. J. S. A.

Determination of hardness of water by Blacher's method, and determination of calcium and magnesium.—See B., 1937, 397.

Determination of carbonate hardness in water.—See B., 1937, 397.

Micro-determination of strontium and calcium in mixtures containing both. A. E. SOBEL, A. PEARL, E. GERCHICK, and B. KRAMER (J. Biol. Chem., 1937, 118, 47–59).—At p_{H} 3.0 Sr in small quantities, although not pptd. alone as oxalate, is co-pptd. with CaC_2O_4 , but in presence of SO_4^{2-} and $\text{C}_2\text{O}_4^{2-}$, SrSO_4 , which is insol. at this p_{H} , is pptd. selectively whilst Ca is still selectively pptd. as CaC_2O_4 . Hence Ca can be determined alone as CaC_2O_4 in presence of Sr as SrSO_4 . Both metals are pptd. quantitatively as oxalate in 20% aq. EtOH at

p_{H} 5.5. As the ppt. adsorbs $\text{C}_2\text{O}_4^{2-}$ it is converted into carbonate, which is dissolved in acid and back-titrated. The resulting solution is available for pptn. as above, CaC_2O_4 being determined by KMnO_4 or after conversion into CaCO_3 . Small amounts of Mg do not affect the combined oxalate ppt.; larger amounts give a slight co-ppt., which is removed by repptn. after dissolving in HCl. R. M. M. O.

Polarographic analysis of commercial barium chloride.—See B., 1937, 340.

Hydrogen carbonate method of separation of beryllium oxide from aluminium oxide. J. A. FIALKOV and L. S. BERENBLUM (Bull. Sci. Univ. Kiev, 1936, 2, 51–57).—Minor modifications of Parsons and Barnes' method (A., 1907, ii, 52) are described. R. T.

Conductometric determination of magnesium by [titration with] sodium hydroxide solution. J. WIERCIŃSKI (Przemysł Chem., 1936, 20, 141–142).—10 g. of limestone are ignited at 850 – 1000° , the product is suspended in 80 c.c. of hot H_2O , 12 c.c. of 50% H_2SO_4 are added, followed by excess of 2N-NaOH and 200 c.c. of 95% EtOH, the suspension is filtered, and the residue is washed with 80% EtOH. The filtrate + washings are boiled to eliminate EtOH, the residue is diluted to 300 c.c., and CO_2 -free air is passed through the solution, which is electro-titrated with 0.5N-NaOH. R. T.

Zinc periodate. Analytical applications. R. FABRE and T. G. TOMESCO (Bul. Soc. Chim. Romania, 1936, 18, 59–61).—The compound $\text{Zn}_5(\text{IO}_6)_2$ was prepared by addition of excess of aq. $\text{Zn}(\text{OAc})_2$ to cold or hot aq. Na periodate. It is a stable white powder, insol. in AcOH, but sol. in very dil. mineral acids. Addition of 2% aq. $\text{Zn}(\text{OAc})_2$ containing 3% of AcOH gives a ppt. with 1 mg. of the periodate ion per c.c. in the cold. IO_3^- gives no ppt. The reaction is not sp. for Zn. H. J. E.

Dithizone method for measurement of small amounts of zinc. P. L. HIBBARD (Ind. Eng. Chem. [Anal.], 1937, 9, 127–131).—Zn (0.001–0.1 mg.) is determined by adding NH_3 to the solution and shaking with a solution of dithizone in CHCl_3 , subsequently comparing the red colour produced with a standard, or titrating with Br. Many other metals, if present, must be separated first. E. S. H.

Determination of zinc in coloured alloys by means of hydroxyquinoline.—See B., 1937, 353.

Rapid determination of zinc in sulphide copper ores, concentrates, and tailings.—See B., 1937, 340.

Spot test for cadmium. F. P. DWYER (J. Proc. Austral. Chem. Inst., 1937, 4, 26–34).—A 0.02% solution of *p*-nitrodiazoaminoazobenzene (prep. described) (I) in 0.02N-KOH-EtOH gives with alkaline solutions of Cd, saturated with Et_2O , a sp. orange-red, slightly fluorescent lake; limiting sensitivity 0.0002 mg. of Cd per c.c. Cu, Ag, Mg, Fe, Co, Ni, Cr, and Mg interfere, but Cd may be detected in presence of 10,000 parts of Bi, Pb, Sn, As, Sb, Al, or Zn. As a spot test, drops of (I), the Cd solution, and KOH are added successively, forming a bright

pink central spot. NH_4 salts inhibit the reaction; Ag and Hg must be separated chemically. Other interfering metals may be suppressed by adding Na K tartrate (II). The blue coloration given by (I) with Mg is inhibited by (II), but Mg may be detected in presence of Cd by adding KCN and then (I).

J. S. A.

Purification of diazoamino-compounds. [Detection of cadmium.]—See A., II, 144.

Separation of lead from copper and their subsequent determination. K. M. SILL, G. C. ROY, and P. N. DAS-GUPTA (J. Indian Chem. Soc., 1936, 13, 747—750).—Pb is pptd. as $\text{Pb}_3\text{O}_4 \cdot 3\text{H}_2\text{O}$ by treating the ammoniacal solution with 3% H_2O_2 , and is weighed as such. Double pptn. is necessary.

J. S. A.

Rapid determination of lead in the atmosphere.—See B., 1937, 397.

Potentiometric studies in oxidation-reduction reactions. I. Oxidation with potassium iodate. B. SINGH and I. ILAHI (J. Indian Chem. Soc., 1936, 13, 717—722).— Ti^+ , Sn^{++} , Hg, AsO_3^{+++} , and SbO^+ may be titrated potentiometrically with 0.05N- KIO_3 in HCl solution.

J. S. A.

Separation and determination of metallic impurities in foodstuffs.—See B., 1937, 389.

Detection of copper with phenolphthalein-cyanide reagent. I. M. KOLTHOFF and J. J. LINGANE (Mikrochem., Molisch Festschr., 1936, 274—278).—0.005 mg. of Cu per litre of H_2O may be detected by its catalytic acceleration of the atm. oxidation and recoloration of phenolphthalein (obtained by reducing phenolphthalein with Zn dust + NaOH) in presence of KCN. In the absence of ions such as $[\text{Fe}(\text{CN})_6]$ which cause oxidation without the presence of KCN, the reaction is sp. for Cu.

J. S. A.

Sodium diethyldithiocarbamate for detecting the solubility corrosion of metals. W. R. G. ATKINS (Trans. Faraday Soc., 1937, 33, 431—432).—Addition of 0.1% of the reagent to a corrosion agent, e.g., sea- H_2O , enables detection and approx. determination of solubility corrosion of metals, especially Cu, Fe, Pb, and Zn.

J. W. S.

Determination of small quantities of copper in iron.—See B., 1937, 352.

Micro-analytical application of "thionalide." R. BERG, E. S. FAHRENKAMP, and W. ROEBLING (Mikrochem., Molisch Festschr., 1936, 42—46).—0.15—0.001 mg. of Hg, Cu, and As may be determined nephelometrically with "thionalide" (I) by treating the salt solution, acidified with H_2SO_4 , with a 1% solution of (I) in AcOH at 100° . The turbidity is compared with that produced from standard solutions of Cu, Hg, or As. 0.005—0.30 mg. of Tl is determined colorimetrically by pptn. with (I) in presence of NaOH + KCN. The ppt. is separated centrifugally, and redissolved in alcoholic H_2SO_4 . The solution is treated with 1—3 drops of a solution (II) of phosphomolybdic acid, Na_2WO_4 , and H_3PO_4 , followed by $\text{HCO} \cdot \text{NH}_2$ at 40° . The solution (II) is reduced by (I), and the blue colour produced is colorimetrically determined against standard Tl solutions or blue dye standards.

J. S. A.

Electro-titration of mercurous salts. E. MICHALSKI (Rocz. Chem., 1937, 17, 83—87).—A galvanometer is connected with two Pt electrodes, immersed respectively in the Hg^+ salt solution and in I in aq. KI, and standard KCl is added to the former solution until the galvanometer reads zero. R. T.

Colour reactions of rare earths with alkaloids. III. F. M. SCHEMJAKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 115—117).— Ce^{IV} gives a dark, and Ce^{III} a light, chocolate ppt. with morphine hydrochloride (I) in aq. NH_3 . In a KOH medium the ppt. with Ce^{III} is \ll that with Ce^{IV} . La^{III} and Th^{III} show no colour effect with (I) in aq. NH_3 , neutral or acid media. With brucine in AcOH, Ce^{IV} gives a stable pink coloration and Ce^{III} , La, and Th show no effect. In alkaline medium Ce^{IV} gives a dark brown ppt. with brucine and Ce^{III} , La, and Th give colourless gelatinous ppts.

O. D. S.

Ferrometric determination of cerium, manganese, chromium, and vanadium in presence of one another. R. LANG and E. FAUDE (Z. anal. Chem., 1937, 108, 181—189).—(a) Ce^{IV} and Mn^{IV} , present together in HPO_3 solution, free from Cl^- , are oxidised by means of $\text{K}_2\text{S}_2\text{O}_8$ in presence of AgNO_3 to Ce^{IV} and MnO_4^- , which are determined by titration with FeSO_4 . In the same solution, Ce^{IV} and Mn^{IV} are then oxidised inductively by means of $\text{K}_2\text{CrO}_4 + \text{AsO}_3^{+++}$. Ce^{IV} and Mn^{IV} so formed are titrated with FeSO_4 . (b) Ce, Mn, Cr, and V together are oxidised by $\text{K}_2\text{S}_2\text{O}_8 + \text{AgNO}_3$ to Ce^{IV} , MnO_4^- , CrO_4^{2-} , and VO_3^- . After titration with FeSO_4 , Ce, Mn, and V are oxidised inductively to Ce^{IV} , Mn^{IV} , and VO_3^- as above. VO^+ in a separate sample is oxidised selectively to VO_3^- by means of KMnO_4 , the excess of which is destroyed by AsO_3^{+++} in presence of OsO_4 . Finally, Ce, Mn, Cr, and V are oxidised completely with $\text{K}_2\text{S}_2\text{O}_8 + \text{Ag}^+$; Ce^{IV} and MnO_4^- are reduced by HCl, leaving $\text{CrO}_4^{2-} + \text{VO}_3^-$, which are determined as before. W, if present, interferes with the final V and Cr titrations. A potentiometric method may be used or, better, Fe, Mn, and Ce may be pptd. as $\text{Fe}(\text{OH})_3$, $\text{Ce}(\text{OH})_4$, and $\text{Mn}(\text{OH})_4$. Mn and Ce in the ppt. are determined as (a); Cr and V in the solution are determined with FeSO_4 after addition of excess of NaF.

J. S. A.

Detection of aluminium with eriochromcyanin. R. E. EGGRIWE (Z. anal. Chem., 1937, 108, 268—269; cf. A., 1929, 530).—The sensitivity of the reaction in presence of other ions is recorded.

J. S. A.

Use of "aluminon" in determining small quantities of aluminium. V. M. PESCHKOVA (Trans. Inst. Pure Chem. Reag. U.S.S.R., 1935, No. 14, 42—48).—To 15 c.c. of the neutral solution are added 5 c.c. of N-HCl, 5 c.c. of 3N- NH_4OAc , and 5 c.c. of 0.1% aluminon reagent. After 5 min. 0.5 c.c. of 5N-aq. NH_3 and of 5N- $(\text{NH}_4)_2\text{CO}_3$ are added. 2.5×10^{-6} g. of Al can be detected. The colour varies in presence of alkali or alkaline-earth ions. Fe should be absent.

CH. ABS. (e)

Determination of aluminium. K. YOUNG and H. LAY (Contr. Inst. Chem., Nat. Acad. Peiping, 1935, 1, 181—188).—Al can be determined in neutral

solutions of its salts by pptn. as basic Al salicylate, and igniting to Al_2O_3 . Filtration is easier than in the case of pptd. $\text{Al}(\text{OH})_3$. CH. ABS. (e)

Determination of aluminium in presence of iron. S. ISHIMARU (Sci. Rep. Tohoku, 1936, 25, 780—784).—The solution is made slightly acid with HCl, a large excess of $\text{Na}_2\text{S}_2\text{O}_3$ is added, and the solution is boiled for 4—5 min. A 1:1 solution of $\text{NHPh}\cdot\text{NH}_2$ in EtOH is added, and the ppt. ignited and weighed as Al_2O_3 . H. J. E.

Microchemical examination of products of corrosion of aluminium and magnesium alloys.—See B., 1937, 355.

Determination of aluminium in ferrosilicon and ferrosilide.—See B., 1937, 352.

Qualitative separations on a micro-scale. II. Separations in the ammonium sulphide group. A. A. BENEDETTI-PICHLER and W. F. SPIKES (Mikrochem., Molisch Festschr., 1936, 3—35).—A complete scheme is described for the qual. analysis of the $(\text{NH}_4)_2\text{S}$ group, including Ga, In, rare earths, Zr, V, Be, W, and U, using <1 c.c. of solution, and following in general the Noyes and Bray macro-separations. Ga + Fe are extracted with Et_2O from HCl solution, and separated by reducing the Fe^{+++} with Hg. Mn is pptd. as MnO_2 from HNO_3 solution before treating the Ni group with Na_2O_2 ; Zn is separated electrolytically from Be. <0.05 mg. of W cannot be detected in presence of Cr, V, U, and PO_4^{---} ; Cr is best removed as CrO_2Cl_2 by treatment with $\text{HClO}_4 + \text{NaCl}$ at 210° . J. S. A.

Detection of bivalent manganese. M. ULJANISCHTSCHEV (J. Appl. Chem. Russ., 1937, 10, 195—196).— Na_2O_2 is moistened with a drop of solution, and the mass is fused; Mn is indicated by formation of green Na_2MnO_4 . R. T.

Colorimetric determination of manganese and molybdenum in steel.—See B., 1937, 352.

Analytical chemistry of rhenium. XII. Crystalline reactions of rhenium trichloride and chlororhenic acid. W. GEILMANN and F. W. WRIGGE (Z. anorg. Chem., 1937, 231, 66—77; cf. A., 1935, 946).— ReCl_3 gives cryst. double salts with KCl, RbCl, CsCl, and hydrochlorides of various org. bases, which are suitable for its identification microscopically. Salts formed from H_2ReCl_6 may similarly be used for the detection of the latter. Photomicrographs are given. F. L. U.

Thiocyanate test for iron. T. N. KARSKOI (Trans. Inst. Pure Chem. Reagents U.S.S.R., 1935, No. 14, 81—87).—The thiocyanate test for Fe cannot be used in presence of Hg and Pb salts and of $\text{Cd}(\text{NO}_3)_2$ and CdSO_4 . It is not entirely satisfactory in presence of Zn salts. CH. ABS. (e)

Determination of metallic iron in presence of ferric and ferrous oxide. I. T. TARANENKO (Zavod. Lab., 1936, 5, 365).—Wilner and Merck's HgCl_2 method is preferred. R. T.

Separation of iron, titanium, and aluminium from their mixtures by means of 8-hydroxyquinoline. A. M. ZANKO and G. A. BUTENKO (Zavod. Lab., 1936, 5, 415—418).—3 g. of NH_4OAc

and 1 g. of tartaric acid are added to 100 ml. of solution. The solution is neutralised with aq. NH_3 , 20 ml. of 80% AcOH and excess of 2% 8-hydroxyquinoline (I) in AcOH are added, and the mixture is heated almost to the b.p. and filtered. The ppt. of Fe salt is washed with dil. AcOH and H_2O , dried, and weighed. The filtrate is conc. to 150 ml., 4 g. of $(\text{NH}_4)_2\text{C}_2\text{O}_4$ are added, the solution is neutralised with aq. NH_3 , 3—5 drops of AcOH are added, and Ti is pptd. by a small excess of (I) in EtOH. The filtrate + washings are diluted to 500 ml., and Al is pptd. from 100 ml. of the slightly alkaline solution by means of 2% (I) in AcOH. R. T.

Application of N-phenylanthranilic acid to simultaneous determination of vanadium and chromium, and to determination of iron in ores. V. S. SIROKOMSKI and V. V. STEPIN (Zavod. Lab., 1936, 5, 263—267).— H_2SO_4 is added to the vanadate solution to 2.5M, and 2—4 drops of 0.005M- $\text{o-NH}_2\text{C}_6\text{H}_4\text{CO}_2\text{Na}$ (I) are added, when a violet coloration develops in presence of $\leq 2 \times 10^{-7}$ g. VV. Cr and V are determined in steel by a modification of Lang and Kurtz' method (A., 1932, 36), with (I) as the indicator. A modification of Knop's method for determination of Fe in ores consists in extraction of the ore with H_2SO_4 , without addition of H_3PO_4 , and titration with $\text{K}_2\text{Cr}_2\text{O}_7$ in presence of (I). R. T.

Colorimetric micro-determination of cobalt and potassium. C. P. SIDERIS (Ind. Eng. Chem. [Anal.], 1937, 9, 145—147).—K is determined indirectly in the $\text{K}_2\text{NaCo}(\text{NO}_2)_6$ ppt. by determining colorimetrically the Co in the acid solution of the ppt. by means of 1:2:3:6- $\text{NO}\cdot\text{C}_{10}\text{H}_4(\text{OH})(\text{SO}_3\text{Na})_2$, which gives with Co salts a stable, intense red coloration. E. S. H.

Determination of nickel in alloys as nickel dimethylglyoxime.—See B., 1937, 353.

Methods of separation in the aluminium-chromium group. A. A. BENEDETTI-PICHLER and W. F. SPIKES (Mikrochem., Molisch Festschr., 1936, 36—41).—Methods for the micro-analysis of the group are discussed with reference to the quant. recovery of V, U, and W. W tends to be lost completely during removal of Cr; separation by conversion of Cr into CrO_2Cl_2 (see above) affords the greatest sensitivity for W. J. S. A.

Spectrum analysis of steel for chromium and tungsten.—See B., 1937, 352.

Micro-colorimetric determination of tungsten in alloy steels.—See B., 1927, 352.

Fluorescence of fluorite. III. Line fluorescence spectrum. IV. Detection of uranium in fluorites and low-temperature fluorescence. H. HABERLANDT, B. KARLIK, and K. PRZIBRAM (Sitzungsber. Akad. Wiss. Wien, 1935, [iii], 144, 77—83, 135—140; Chem. Zentr., 1936, i, 2898; cf. A., 1936, 1089).—III. Data are recorded for fluorites, yttrifluorites, and synthetic fluorites activated with rare earths.

IV. Fluorescence due to Eu and Yb is destroyed by ignition; that due to U is unaffected, and forms a measure of the [U]. The yellowish-green low-temp.

fluorescence due to Yb increases with the proximity of the source of fluorites to eruptive rocks.

J. S. A.

Determination of titanium in non-rusting steels.—See B., 1937, 352.

Separation of hafnium and zirconium. II. Role of phosphoric acid in the chemistry of zirconium. W. PRANDTL, G. MAYER, and L. BUTTNER (Z. anorg. Chem., 1937, 230, 419—426; cf. A., 1933, 38).—The $\text{PO}_4^{'''}$ content of several Zr minerals has been determined. $\text{PO}_4^{'''}$ is present in all the minerals examined, although generally in amounts that might escape detection, and interferes with the separation of Zr and Hf by the $\text{K}_4\text{Fe}(\text{CN})_6$ procedure.

E. S. H.

Use of hexamine for the separation of thorium from the rare earths, and its application to the determination of thorium in monazite sand. A. M. ISMAIL and H. F. HARWOOD (Analyst, 1937, 62, 185—191).— $(\text{CH}_2)_6\text{N}_4$ in presence of NH_4 salts ppts. Th (as hydroxide) but not the other rare earths. Ce may then be pptd. in the filtrate by addition of aq. NH_3 and H_2O_2 and boiling. The max. recorded difference is 0.07% compared with the longer $\text{Na}_2\text{S}_2\text{O}_3$ method for monazite sand.

J. G.

Volumetric determination of vanadates by a precipitation method. K. S. MIROSCHNITSCHENKO (Mem. Inst. Chem. Ukrain. Acad. Sci., 1936, 3, 573—575).—25 ml. of 0.1N- AgNO_3 are added to 10 ml. of neutral, approx. 0.1N- Na_3VO_4 , and excess of Ag is titrated in the filtrate.

R. T.

Separation of vanadium pentoxide from vanadate solutions containing sexavalent chromium. E. F. KRAUZE and O. I. VOROBIEVA (J. Appl. Chem. Russ., 1937, 10, 197—201).—93—96% of the VV present in vanadate solutions is pptd. by adding HCl to 0.03—0.18N. The ppt. does not contain Cr.

R. T.

Electro-analytical determination of antimony. S. L. YOVANOVITCH (Compt. rend., 1937, 204, 686—688).—Correct conditions for satisfactory deposition of Sb are described. Dil. H_2SO_4 solutions originally containing solid hydrolysis products gave good results.

A. J. E. W.

Determination of small amounts of antimony by the method of internal electrolysis. N. S. KRUPENIO (Zavod. Lab., 1936, 5, 592—593).—A pellet of Co (0.2—0.3 g.) is left in contact with Pt gauze immersed in 50 ml. of acid solution, for 2 hr. and the gauze is washed, dried, and weighed, when the difference between initial and final wt. represents the Sb content of the solution. Cu, but not Sn, interferes.

R. T.

Rapid determination of antimony in lead-rich alloys.—See B., 1937, 354.

Colorimetric determination of niobium and tantalum. N. F. KRIVOSCHLIKOV and M. S. PLATONOV (J. Appl. Chem. Russ., 1937, 10, 184—191).—Nb gives a yellow coloration with alkaline, but not acid, solutions of pyrogallol in aq. Na_2SO_3 , whilst the reverse is the case for Ta. A colorimetric method for determination of Nb and Ta, based on these effects, is described.

R. T.

Qualitative reactions for niobium and tantalum. M. S. PLATONOV, N. F. KRIVOSCHLIKOV, and A. A. MARAKAEV (J. Gen. Chem. Russ., 1936, 6, 1815—1817).—Excess of aq. NH_3 and resorcinol in aq. $(\text{NH}_4)_2\text{C}_2\text{O}_4$ are added to the solution; a blue colour develops in presence of Nb (<0.5 mg. per ml.), whilst Ta and Ti give faint green colorations. Pyrogallol gives a yellow coloration with Nb and Ti in alkaline, and with Ta (<0.05 mg. per ml.) and Ti in acid, solution; the colour due to Nb or Ta, but not Ti, is discharged by H_2O_2 .

R. T.

Determination of gold by Chiddy's method. A. WOGGINZ (Z. anal. Chem., 1937, 108, 266—267).—Au in cyanide liquors containing $[\text{Fe}(\text{CN})_6]^{'''}$ may be determined by evaporating the liquid down with H_2SO_4 . The insol. residue, after dilution, is separated and dissolved in HCl + HNO_3 , and is subsequently determined by Chiddy's method.

J. S. A.

Gas burners in the laboratory. J. G. DE VOOED (Chem. Weekblad, 1937, 34, 187—191).—The heating efficiencies of gas rings (screened) and Bunsen, Teclu, and Heintz burners for heating H_2O to the b.p. in Erlenmeyer flasks are compared. When a Bunsen burner is properly used, its efficiency is almost equal to that of a gas ring (about 30%). The type of glass used for the flask has practically no effect but asbestos gauzes reduce the efficiency to 2/3. Cr-Ni gauze is recommended for laboratory use. For large quantities of H_2O the best efficiency (80%) is obtained by using flat metal pans.

S. C.

Simple laboratory cryptol furnace. M. L. VINOKUR (Zavod. Lab., 1936, 5, 679—681).

R. T.

Constant-temperature gas-regulated water-bath. J. L. PARKINSON (J. Sci. Instr., 1937, 14, 94—96).—The double-chamber bath described is suitable for use at any temp. about 3° > its surroundings, and is const. to $\pm 0.001^\circ$. The H_2O in both chambers is stirred by air bubbles, and the gas jet is regulated by a capillary dipping into a $\text{Hg}-\text{CHCl}_3$ -filled spiral.

N. M. B.

Automatisation of the d'Arsonval thermostat. G. B. TALKOVSKI (Zavod. Lab., 1936, 5, 681).

R. T.

Thermoregulator for high temperatures. A. S. MICHELSON (Zavod. Lab., 1936, 5, 792—793).

R. T.

Short-period platinum thermometers. J. J. MANLEY (Phil. Mag., 1937, [vii], 23, 695—701).—The construction and time-constants for cooling in air and H_2O of 13 thermometers designed for min. heat capacity, max. resistance with limited bulb vol., and instantaneous response to small temp. variations, for measuring small changes in the m.p. of substances consequent on intensive drying, are described.

N. M. B.

Use of Philips sodium lamps in polarimetry. P. KARSTEN (Chem. Weekblad, 1937, 34, 195—196).—The light source in Philips Na lamps is too narrow to illuminate the field of a polarimeter uniformly. This is obviated by the use of a screen of ground glass placed between the lamp and the instrument.

S. C.

Chromatography under pressure. C. SANNIE (Bull. Soc. chim., 1937, [v], 4, 580—582).—Modified apparatus is described. E. S. H.

Sachs focussing camera for inverse roentgenograms. V. V. NETSCHVOLODOV (Zavod. Lab., 1936, 5, 345—346). R. T.

Film camera, with cathode-ray oscillograph, for experiments on artificial radioactivity. L. G. GRIMMETT and W. H. RANN (J. Sci. Instr., 1937, 14, 96—100).—The construction and performance of a camera for photographing (four tracks on a film) the movements of the light spot of an oscillograph are described. The film speed can be const. or can vary automatically to follow the activity being studied. N. M. B.

Cameras for X-ray analysis by the inverse-ray method. J. P. SELISKI (Zavod. Lab., 1936, 5, 779—782). R. T.

Measurement of intensity of X-rays. V. I. VEKSLER, A. V. BIBERGAL, and M. P. IVANOV (J. Exp. Theor. Phys. U.S.S.R., 1935, 5, 490—495).—A Geiger-Müller counter is combined with a thyratron and used for intensities of 10—1000 quanta per sec. CH. ABS. (e)

Measuring absorption coefficients for X-rays by means of a tri-electrode ionisation chamber. G. A. WRENSHALL and E. L. HARRINGTON (Canad. J. Res., 1936, 14, A, 209—215).—Modifications in the method used by Stoner and Martin (A., 1925, ii, 257) are described. The use of a pair of sectored Pb discs, the common aperture of which can be adjusted during rotation, and of a three-electrode ionisation chamber results in increased simplicity and accuracy. F. L. U.

Photo-electric spectrophotometer of high accuracy. J. S. PRESTON and F. W. CUCKOW (Proc. Physical Soc., 1937, 49, 189; cf. this vol., 48).—An addendum. N. M. B.

Absorption spectrophotometry of solutions in the short-wave ultra-violet. H. MOHLER (Helv. Chim. Acta, 1937, 20, 282—285).—Apparatus and technique are described. E. S. H.

Modern refractometry. B. PESCE (Atti V Congr. Naz. Chim., 1936, 2, 446—459).—Improvements in the measurement of the refraction of liquids at 0—85° by means of the Pulfrich refractometer are described. The interpretation of refractometric measurements of electrolytes in terms of the deformation and association of ions is reviewed. O. J. W.

Photometric test plates. A. K. TAYLOR (Proc. Physical Soc., 1937, 49, 105—111).—Characteristic curves of the variation of reflexion factor with the angles of incidence and view are given for flat plates of white pot opal glass, MgO, white filter-paper, white matt celluloid, Mg oxychloride, white blotting-paper, and plaster of Paris. The use of the plates as sub-standards of reflexion factor or for measurement of illumination is discussed. N. M. B.

Researches on chemical kinetics by means of photo-electric colorimetry. U. SBORGHI [with E. RABAGLIA] (Atti V Congr. Naz. Chim., 1936, 2, 531—543).—A photo-electric colorimeter, which has been

used in studying the reaction between H_2O_2 and KI in aq. solution and the catalytic effect of Fe^{++} ions thereon, is described. O. J. W.

Colorimetry with colloidal solutions. R. JUZA and R. LANGHEIM (Angew. Chem., 1937, 50, 255—260).—Using a Zeiss Pulfrich photometer, with filter S. 53 to give max. sensitivity, Ni can be accurately determined colorimetrically with diacetyldioxime, if gelatin be added as protective colloid. The Lambert-Beer Law is followed for $[\text{Ni}] = 0.025\text{--}0.500$ mg. per 50 c.c. With certain precautions, the determination is accurate in presence of Co, Zn, Mn, and Co + Zn + Mn. Similarly Cu may be determined as the ferro-cyanide, and Cd as CdS if gelatin be added. R. C. M.

Time lag in the vacuum photo-cell. N. R. CAMPBELL (Nature, 1937, 139, 330).—The KV6 cell always contains H_2 and should not be regarded as a true vac. cell. (cf. A., 1937, I, 113). L. S. T.

Photometry by means of a photo-element. V. A. SUCHICH and N. N. PETIN (Zavod. Lab., 1936, 5, 763—764).—Intensity of light is measured by means of a photo-electric cell. R. T.

Measurement of hydrogen-ion concentration by means of the glass electrode. S. M. MEHTA (J. Univ. Bombay, 1936, 5, Part II, 77—82).—Modified apparatus and technique are described. E. S. H.

Comparator for p_{H} determination. E. A. ANDREEVA (Zavod. Lab., 1936, 5, 352—353). R. T.

Continuous measurement of p_{H} . F. TODT (Chem. Fabr., 1937, 10, 121—124).—Continuous-flow valve potentiometer devices, with special reference to quinhedrone and Sb electrodes, and photo-electric colorimeters are described. J. S. A.

Glass electrode and p_{H} control. K. SCHWABE (Z. Elektrochem., 1937, 43, 152—155).—The application of the glass electrode to measurement of p_{H} and to acidimetric titrations is described. C. R. H.

Electrodes for p_{H} measurement. A. R. RIDDLE (J. Council. Sci. Ind. Res. Australia, 1937, 10, 45—46).—To avoid cracking of glass holders of Pt electrodes and also the poisoning of electrodes by blue sealing glass, the electrode is connected to an insulated bronze rod by means of Pt wire and a porcelain connector. A. G. P.

Measurement and control of p_{H} with the glass electrode. D. A. MACINNES and L. G. LONGSWORTH (Trans. Electrochem. Soc., 1937, 71, Preprint 14, 141—156).—The history of the glass electrode and constructional details of modern types are discussed. Apparatus in which the electrode is applied to routine p_{H} measurement and to maintaining a const. p_{H} during bacterial growth is described. J. W. C.

Visual balance-detectors for conductance bridges. C. MORTON (Trans. Faraday Soc., 1937, 33, 474—479).—A full-wave metal rectifier connected to a d.c. galvanometer can be used as an a.c. balance detector over a wide frequency range for p.d. ≤ 0.1 mv. A thermionic a.c. balance detector is also described. J. W. S.

Electron-beam spectrometer. Line-operated vacuum-tube titrometer for potentiometric titrations with cathode-ray tube replacement of the micro-ammeter. G. F. SMITH and V. R. SULLIVAN (J.S.C.I., 1937, 56, 104—108r).—The arrangement described employs the 6E5 cathode-ray tube, and indicates equivalence-breaks automatically. It is generally applicable with any of the usual electrode systems, and the sector shadow responds instantly to changes of potential in the titration cell, giving an insight into reaction velocities; effects due to temp., acidity, and dilution are readily noted. N. M. B.

Apparatus for electrodialysis. Č. NUČIĆ (Arh. Hemiju, 1936, 10, 97—100). R. T.

Appliance for use in electrometric micro-titration and electro-analysis. S. I. RASPOPOV and D. N. FINKELSCHTEIN (Zavod. Lab., 1936, 5, 353—354). R. T.

Determination of dielectric constants at very high frequencies. V. I. KALININ (Physikal. Z. Sovietunion, 1936, 10, 257—259).—A modification of the second method of Drude is described. A. J. M.

Half-element for electrometric measurements. C. J. RABINOVITSCH (Zavod. Lab., 1936, 5, 676).—A cell, in which a Pt wire wound around a W rod is immersed in 25% H_2SO_4 in a sintered glass funnel, is described. R. T.

Efficiency of the γ -ray counter. H. YUKAWA and S. SAKATA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 187—194).—Efficiencies are calc. for counters made of Al and Pb, and for a counter with a wall which is thin compared with the range of most of the secondary electrons. H. J. E.

Sensitiveness of a Geiger point counter in the region between its threshold voltage and the voltage for constant counting. B. DASANNA-CHARYA and T. S. K. MOORTHY (Phil. Mag., 1937, [vii], 23, 609—620).—The β -ray sensitivity of a Geiger point counter depends on the geometry of the ray, determined by the position of the radioactive source, and the applied voltage. The effect of placing sheets of paper and Al of various thicknesses between the source and the counter is discussed. F. J. L.

Method of measuring electrophoresis by the ultramicroscope. T. B. LANE and P. WHITE (Phil. Mag., 1937, [vii], 23, 824—828).—Measurements based on Smoluchowski's theory may be in error by >30%. The true electrophoretic velocity is the mean of vals. at the two prescribed levels. Results on a graphite sol are corr. from 20.4 to 2.3% probable error. N. M. B.

Mechanical tracer for electron trajectories. D. GABOR (Nature, 1937, 139, 373).—An apparatus for tracing the paths of electrons in electrostatic fields is described. L. S. T.

[Apparatus for] potential measurements in oxido-reduction mixtures. D. B. KROON (Science, 1937, 85, 205—206). L. S. T.

Application of electrolytic rectification of alternating current in electro-drop analysis. H. FRITZ (Mikrochem., Molisch Festschr., 1936, 125—129; cf. A., 1935, 1473).—The direct use of a.c. in

conjunction with rectifying electrodes of Al, Ta, or Mg is recommended. J. S. A.

Field distortion in the standard ionisation chamber. W. H. LOVE and W. B. SMITH-WHITE (Brit. J. Radiol., 1936, [ii], 9, 51—58; Chem. Zentr., 1936, i, 3095).—Distortion of the field by direct charging of the collector plate to potentials <1 volt is negligibly small, the vol. from which ions are collected being changed by <0.35%. J. S. A.

Separation of magnetic particles under the microscope. E. W. BLANK (J. Chem. Educ., 1937, 14, 33).—A device which enables magnetic particles to be separated and recovered is described. L. S. T.

Auto-bubbler pipette. M. BURTON and T. W. DAVIS (Ind. Eng. Chem. [Anal.], 1937, 9, 139). E. S. H.

Simple micro-burette. M. STRUSZYŃSKI (Przemysł Chem., 1936, 20, 53—55).—A tube is drawn to a capillary jet (diameter 0.12 mm.), and weighed, filled with standard solution. The tip is immersed in the solution to be titrated, and the tube is reweighed after completed titration. R. T.

Simple micro-burette. A. L. VOROBIEV (Zavod. Lab., 1936, 5, 798).—A pipette is fitted with a capillary jet (diameter >0.5 mm.), and filling and delivering are achieved by means of a rubber bulb. R. T.

Measuring vessels. J. S. LIALIKOV (Zavod. Lab., 1936, 5, 793—795).—Burettes and pipettes of Russian manufacture are criticised. R. T.

Use of normal ground joints in micro-Kjeldahl apparatus. J. UNTERZAUFER (Mikrochem., Molisch Festschr., 1936, 436—438).—The decomp. flask is used also for the distillation, the distillation head fitting on by a standard ground-glass joint. J. S. A.

Apparatus for micro-hydrogenation by a volumetric method. H. BRETSCHNEIDER and G. BURGER (Chem. Fabr., 1937, 10, 124—127).—Apparatus and technique are described. J. S. A.

Membrane or frits for measurements by the dialysis method. H. BRINTZINGER and H. BEIER (Z. anorg. Chem., 1937, 230, 381—384).—Comparative measurements of diffusion coeffs. show that cellulose membranes have advantages over glass frits. E. S. H.

Tap-grease for ground-glass surfaces. A. T. SVESCHNIKOV (Zavod. Lab., 1936, 5, 503).—20 parts of rubber solution are mixed with 80 of vaseline, and the mixture is heated to complete elimination of light petroleum. R. T.

Preparation of polished surfaces for metallographic analysis. V. J. KIZELSCHEIN (Zavod. Lab., 1936, 5, 324—330).—The prep. of abrasive pastes, consisting of Cr_2O_3 80, SiO_2 gel 3, stearin 15, and kerosene 2%, for rough, and Cr_2O_3 74, SiO_2 gel 2, stearin 20, kerosene 2, and stearin fat 2%, for fine, polishing is described. R. T.

Automatic control for currents of gas under moderately reduced pressures. R. C. BRIMLEY (J. Sci. Instr., 1937, 14, 102—103).—A device consisting of a glass tube divided into two by a porous diaphragm is described; the amount of diaphragm

exposed by mercury from a connected manometer is controlled by suction. N. M. B.

Hydrostatic prospecting balance. P. DE BETHUNE (*Natuurwetensch. Tijds.*, 1937, **19**, 77—82).—The specimen is balanced in air at a suitable position on the left-hand beam against a counterpoise placed at the end of the right-hand beam. It is then immersed in H_2O and the counterpoise moved along the right-hand beam, which is graduated to give d directly. The balance is very simply constructed. S. C.

Air-driven ultracentrifuge for molecular sedimentation. R. W. G. WYCKOFF and J. B. LAGSDIN (*Rev. Sci. Instr.*, 1937, [ii], **8**, 74—77).—Improvements in the driving mechanism, construction, light source, and photographic recorder of the apparatus previously described (cf. A., 1936, 956) are detailed. N. M. B.

Meter for recording slow liquid flow. J. O. IVIE and L. A. RICHARDS (*Rev. Sci. Instr.*, 1937, [ii], **8**, 86—89).—The reversible meter described is designed to work as part of a soil moisture flow gauge, the flow being measured by forming drops of water in a less dense non-miscible liquid and electrically recording the drops. An empirical equation for the effect of temp. and flow rate on drop size is derived. N. M. B.

Variational graph paper for determination of distribution [of results] of analysis. L. A. BIZOV (*Zavod. Lab.*, 1936, **5**, 644—651). R. T.

Apparatus for washing out precipitates. V. I. SALMINEN (*Suomen Kem.*, 1937, **10**, A, 40). M. H. M. A.

Measuring rotational speeds. L. B. SNODDY and J. W. BEAMS (*Science*, 1937, **85**, 273—274).—A simple method for speeds up to 3000 r.p.s. is described. L. S. T.

Precision determination of the lattice constants of coarse-grained materials. H. KOSTRON (*Z. Metallk.*, 1936, **28**, 390—391).—A driving mechanism for rotating the specimens in determining the lattice consts. by the back-reflexion method is described. A. R. P.

Electrosmotic circulation in closed vessels. P. WHITE (*Phil. Mag.*, 1937, [vii], **23**, 811—823).—Mathematical. Two sources of error in electrophoretic measurements are eliminated by interpretation of results in the light of proposed modifications to Smoluchowski's theory. N. M. B.

Regulating beaker stand. C. E. MARTINSON (*J. Chem. Educ.*, 1937, **14**, 30).—A device for adjusting the height of a beaker in a Witt filter flask is described. L. S. T.

Micro-determination of density of liquids by the coloured jet method. M. STRUSZYŃSKI (*Przemysł Chem.*, 1936, **20**, 51—53).—A trace of dye is added to 0.1 c.c. of liquid, which is introduced through a horizontal capillary tube into a liquid of known d , in which the given liquid is sol. The jet of coloured fluid is horizontal when the d of the two liquids are identical. R. T.

Preparative handling of small amounts of material. A. SOLTYS (*Mikrochem., Molisch Festschr.*,

1936, 393—404).—The technique of evaporation, centrifugal filtration, and distillation etc. on a micro-scale is discussed. J. S. A.

Smoke method of measuring supersonic velocities. R. C. PARKER (*Proc. Physical Soc.*, 1937, **49**, 95—104; cf. Pearson, *ibid.*, 1935, **47**, 136).—The smoke method has been investigated with elimination of various sources of error. The mean velocities for the frequency range 92.2—801.7 kc. per sec. in air, O_2 , and N_2 were 331.7₆, 315.3₀, and 337.0₂ m. per sec. correct to 1 in 3000. There was no evidence of dispersion. N. M. B.

Viscosimeter with removable capillary. LOUIS (*Ann. Off. nat. Comb. liq.*, 1936, **11**, 1149—1151).—By changing the size of the capillary tube in the apparatus described investigation of a wide range of η is possible. R. B. C.

Efficiency of packings of laboratory distilling columns. M. J. MARSHALL, F. WALKER, and D. H. BAKER (*Canad. J. Res.*, 1937, **15**, B, 1—6).—No. 18 is the most efficient size of jack chain for packing distilling columns, as tested by the separation of EtOH- H_2O mixtures. Lessing rings, 0.22 in. diameter, are less efficient. J. W. S.

Automatic apparatus for laboratory steam distillations and for the determination of water. C. P. A. KAPPELMEIER (*Chem. Weekblad*, 1937, **34**, 219—220).—An apparatus for the continuous steam distillation of volatile solvents from paints etc. is described. The sample is boiled with H_2O and the distillate is collected in a graduated U-tube, the solvent collecting in one limb and the condensed H_2O passing from the other back to the flask. By using CCl_4 instead of H_2O the apparatus can be used for determining the H_2O content of oils etc. Dioxan is recommended for cleaning the apparatus. S. C.

Determination of permeability of synthetic materials towards water vapour. B. WURZSCHMITT and F. W. KERCKOW (*Z. anal. Chem.*, 1937, **108**, 247—249).— H_2O vapour diffuses from a space of controlled humidity through a septum of the material, into a dried gas stream. The rate of transpiration is then determined gravimetrically by absorption in P_2O_5 . J. S. A.

Technique of preparing ultrafilters and their use in analytical chemistry. G. L. ABKIN (*Kolloid. Shurn.*, 1935, **1**, 571—574).—Paper filters are dipped three times in a collodion solution. J. J. B.

Special type of fluted filter. D. G. MOSKVIN (*Zavod. Lab.*, 1936, **5**, 359—360).—A method of folding fluted filter-papers is described. R. T.

Rapid filtration of silicic acid. N. N. LISITZKI (*Zavod. Lab.*, 1936, **5**, 366—367).—The prep. of filter-paper reinforced with cellulose pulp, for rapid filtration of SiO_2 gel, is described. R. T.

Measurement of surface tension. S. M. MEHTA (*J. Univ. Bombay*, 1936, **5**, Part II, 101).—A correction (cf. *ibid.*, 1935, **4**, 138). E. S. H.

Fixation of nitrogen. S. ZUFFANTI (*J. Chem. Educ.*, 1937, **14**, 73).—A lecture demonstration. L. S. T.

Origin of Fahrenheit's thermometric scale. J. N. FRIEND (*Nature*, 1937, 139, 395—398).

L. S. T.

Historical development of the conception of chemical elements. B. N. MENSCHUTKIN (*J. Chem. Educ.*, 1937, 14, 59—61).

L. S. T.

Hermann Kopp, historian of chemistry. J. RUSKA (*J. Chem. Educ.*, 1937, 14, 3—12).—Historical.

L. S. T.

Chemical philosophy of Jean Baptiste van Helmont. (MLLE.) H. METZGER (*Ann. Guébhard-Séverine*, 1936, 12, 140—155).

Geochemistry.

Chemical exploration of the stratosphere. F. A. PANETH (*Proc. Roy. Inst.*, 1937, 29, 350—366).—A lecture.

Analysis of radioactive water of the Celja spring. S. MIHOLIĆ (*Arh. Hemiju*, 1936, 10, 85—89).—Analytical data are recorded.

R. T.

Moldavian water courses. I. ATANASIU and R. CERNATESCU (*Ann. Sci. Univ. Jassy*, 1935, 21, 486—496).—Analyses of H_2O from the steppe rivers Jijia and Balhui show that the mineralisation of a river is determined mainly by the alterations in its basin. There is much Na_2SO_4 and $MgSO_4$, probably produced by exchange of Na and Mg for Ca by the clay substance, a process which at an earlier date must have been reversed as is shown by the low concn. of Cl relative to Na. The carpathic rivers Moldova, Bistrita, and Trotus were also examined. The cryst. nature of the basin of the Bistrita, and saliferous nature of that of the Trotus, account for the low mineralisation of the former, and high content of Na and Cl' of the latter, river. In the carpathic rivers $[Ca^{++}]$ and $[HCO_3^-]$, and $[Na^+]$ and $[Cl^-]$, are nearly equal, whereas in the steppe rivers $[HCO_3^-] \gg [Ca^{++}]$, and $[Na^+] \gg [Cl^-]$.

R. C. M.

Andesitic rocks of Ditrau. V. IANOVICI (*Ann. Sci. Univ. Jassy*, 1935, 20, 86—97).—An analysis of the silicates and a discussion of their inter-relationships is given.

R. S. B.

Analysis of the water of the river Bahlui (Roumania). I. ATANASIU and R. CERNATESCU (*Ann. Sci. Univ. Jassy*, 1935, 20, 406—414).—Variation in dissolved mineral has been studied.

R. S. B.

Radioactivity of the water and mud of the lakes of Southern Bessarabia. A. CISMĂN (*Ann. Sci. Univ. Jassy*, 1935, 20, 190—196).—The H_2O has a negligible radioactivity. For the mud from the lakes Budaki and Burnaz the radioactivity is, respectively, 0.54 and 0.47 m. μ c. per litre.

R. S. B.

Attempts to discover eka-caesium. K. HELLER and A. MAYER (*Mikrochem., Molisch Festschr.*, 1936, 201—208).—Eka-Cs (87) could not be detected in various Bohemian natural springs and saline deposits rich in Rb and Cs.

J. S. A.

Regularities in the composition of mineral gases. J. V. GRETSCHNI (*Ukrain. Chem., J.*, 1937, 12, 42—52).—The content of He , N_2 , and A of the gas in natural reservoirs falls with increasing depth of the reservoir, and with decrease in the relative vol. of capillary H_2O to that of the reservoir.

R. T.

Tenham (Queensland) meteoritic shower of 1879. L. J. SPENCER (*Min. Mag.*, 1937, 24, 437—

452).—A collection of 102 stones (total wt. 107½ lb.) represents only a portion of the fall of this unique shower. The stones are of the veined enstatite-olivine-chondrite type. In chemical composition (a previously unpublished analysis made in 1913 in the Govt. Chem. Lab., Brisbane) they are very close to the Warbreccan stones from the same district (A., 1916, ii, 633), which probably belong to the same fall. Showers of meteoritic stones have been produced by the breaking up of a single large mass of friable material in the earth's atm. With the more coherent siderites showers are much less common, and a meteorite crater could be formed only by a very large siderite.

L. J. S.

Stony meteorites can furnish no indication of the nature of basic rocks. R. PERRIN (*Compt. rend.*, 1937, 204, 509—510).—The composition of meteorites is not a trustworthy indication of the average composition of the bodies from which they originate.

A. J. E. W.

Analysis of the powder which fell on 26 April, 1928. (A) A. S. COCOSINSCHI (*Ann. Sci. Univ. Jassy*, 1935, 20, 116—117); (B) R. CERNATESCU (*Ibid.*, 1935, 16, 173—174).—(A) The analysis is compared with that of Cernatescu (*ibid.*, 1929, 16, 29).

(B) Polemical.

R. S. B.

The tektite problem. L. J. SPENCER (*Pop. Astron.*, 1936, 44, 381—383; *Min. Mag.*, 1937, 24, 503—506; cf. A., 1933, 252, 802, 1268).—Fused material on the surface of meteorites is ablated as quickly as formed, leaving only a film to solidify as glass. Tektites could, therefore, not have been completely fused and shaped in the earth's atm. These natural glasses, found in strange situations, are quite different in composition from any meteorite actually observed to fall. Of known terrestrial materials, they compare most closely with the silica-glass formed by the fusion of terrestrial rocks at meteorite craters.

L. J. S.

Potash-soda-felspars. I. Thermal stability. E. SPENCER (*Min. Mag.*, 1937, 24, 453—494; cf. A., 1930, 1397).—Chemical analyses and optical data are given for 26 K Na felspars, and the effects of heating to 1120° studied in detail. In the orthoclase-microperthite series there is (up to 60% Na_2O) a linear relation between d , n , and albite content; and albite conforms to the end-member of the series. The members of this series usually show a fine perthitic structure with schiller, and when heated for some time at 750—800° the microperthite goes into solid solution with destruction of this structure and diminution in d and n . On very slow cooling again exsolution occurs and the original properties

reappear. Adularia, sanidine, anorthoclase, and microcline show some variations in their optical properties from this series, depending apparently on their thermal history. L. J. S.

Texture analysis of metamorphic rocks. Orientation rule for cyanite. C. ANDREATTA (Period. Min., 1935, 6, 205—212; Chem. Zentr., 1936, i, 3115).—Cyanite crystals in gneiss appear to be generally oriented preferentially with (100) parallel to the foliation. J. S. A.

Two granites from the Cogne mines, Aosta valley. A. SANDERO (Period. Min., 1935, 6, 205—212; Chem. Zentr., 1936, i, 3115).—Characteristics are described. J. S. A.

Coralloidal opal. C. R. SWARTZLOW and W. D. KELLER (J. Geol., 1937, 45, 101—108).—Coralloidal opal, an epigenetic opaline deposit found in lava tubes, is pptd. by capillary H_2O on the tips of basalt spines and globules, which gives the deposit an appearance of some forms of org. coral. Some of the opal gives a slight carbonate reaction. Hydration of minerals in the surrounding basalt is the source of the material. L. S. T.

Eclogites in the neighbourhood of Glenelg, Invernesshire. A. R. ALDERMAN (Quart. J. Geol. Soc., 1936, 92, 488—530).—The Glenelg eclogites are composed essentially of garnet and omphacite. Chemical analyses are recorded, and a statistical survey of analyses of typical eclogite minerals is presented. L. S. T.

New lamprophyres and monchiquites from Jersey. H. G. SMITH (Quart. J. Geol. Soc., 1936, 92, 365—383).—Descriptive. L. S. T.

Accessory minerals in igneous and metamorphic rocks. J. C. REED (Amer. Min., 1937, 22, 73—84).—A review. L. S. T.

Nature and relations of the zeolites. M. H. HEY (Trans. Ceram. Soc., 1937, 36, 84—97).—A summary of the present knowledge of the nature and properties of the true zeolites and their relationship to the artificial zeolites and the clays. J. A. S.

Zeolites. A. N. WINCHELL (Amer. Min., 1937, 22, 85—96; cf. *ibid.*, 1925, 10, 166).—Variations in composition in thomsonite, chabazite, and gmelinite; phillipsite and stilbite; gismondite, mesolite, scolecite, natrolite, laumontite, heulandite, mordenite, and ptilolite are represented diagrammatically and discussed. L. S. T.

Structure of serpentines. J. W. GRUNER (Amer. Min., 1937, 22, 97—103; cf. A., 1936, 1483).—X-Ray diffraction lines for chrysotile (I) and antigorite (II) structures are tabulated and discussed. Serpentine is divided into these two groups and all other variety names should be discontinued. Dimorphism probably exists and X-rays are often the only means of identification since optical properties are similar in both groups. As shown by Warren and Bragg (A., 1931, 415), (I) has a chain structure, and the structure of (II) may be chain- or sheet-like. L. S. T.

Oriented inclusions of magnetite and hæmatite in muscovite. C. FRONDEL and G. E. ASHBY (Amer. Min., 1937, 22, 104—121).—Inclusions of magnetite (I) and hæmatite (II), which are described and illustrated, have been identified in muscovite (III) from numerous localities. Structural relations of (I), (II), and (III) are discussed. L. S. T.

Heavy accessory minerals of the Val Verde tonalite. R. W. WILSON (Amer. Min., 1937, 22, 122—132).—These minerals are relatively limited but of fairly const. frequency. Zircon, apatite, and sphene are the chief. L. S. T.

Aenigmatite. N. L. BOWEN (Amer. Min., 1937, 22, 139—140).—Aenigmatite from a lava from Lake Niavasha has α 1.81 ± 0.01 , β 1.82 ± 0.01 , γ 1.88 ± 0.015 . L. S. T.

Paragenesis of potassium and magnesium. J. GRZYMEK and T. KUCZYŃSKI (Przemysł Chem., 1935, 19, 186—190).—Formation of schonite from saturated aq. K_2SO_4 - $MgSO_4$ does not take place in presence of an equal vol. of MeOH, at -40° . Separate crystallisation of K_2SO_4 and $MgSO_4$ from super-saturated 1:1 MeOH- H_2O solution is possible at room temp. R. T.

Paragenesis of pyrrhotite. G. M. SCHWARTZ (Econ. Geol., 1937, 32, 31—55).—The minerals most commonly associated with pyrrhotite in order are: chalcopyrite, pyrite, sphalerite, arsenopyrite, magnetite, pentlandite, cubanite, and marcasite. Relative ages are discussed. L. S. T.

Lepidolite from Kyubiri, Korea. J. YOSHIMURA, T. SUDŌ, and Y. FUKAZAWA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 166—169).—Composition and optical properties are recorded. H. J. E.

Asbestos deposits of Thetford District, Quebec. S. PAIGE (Econ. Geol., 1937, 32, 108—109).—A discussion of previous conclusions (cf. A., 1936, 308, 1357). L. S. T.

Mineralogy and chemical composition of garnets from the schist complex of Nellore. N. JAYARAMAN (Proc. Indian Acad. Sci., 1937, 5, A, 148—160).—Specimens of garnet from the mica schist of Nellore all comprised a mixture of almandine, pyrope, grossularite, and spessartite in varying proportions, with quartz, ilmenite, and sillimanite inclusions. The variations of colour and physical properties with composition and with the impurities present are traced. J. W. S.

Geochemical diagram of the pegmatites of the principal arcs of mountain chains of Central Asia. A. F. SOSEDKO (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 299—301).—A diagram is given showing the occurrence of pegmatites, arranged according to the time of their formation, in the central part of the Turkestan mountain chain. O. D. S.

Composition of cassiterites. J. LARIONOV and J. M. TOLMATSHEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 303—306).—The qual. compositions of hydrothermal and pegmatitic cassiterites from the Turkestan chain have been determined spectrographically, and are compared. O. D. S.

BRITISH CHEMICAL ABSTRACTS

A., I—General, Physical, and Inorganic Chemistry

JUNE, 1937.

Electrical and optical measurements on the illumination of helium in the high-frequency discharge. J. ROIG (Compt. rend., 1937, 204, 961—964; cf. A., 1931, 1343).—The characteristics of a valve oscillator causing the discharge, and the intensity of the illumination, have been investigated.

A. J. E. W.

Ultra-violet wave-length standards of N, C, and O, $\lambda\lambda$ 2300—1080. R. L. WEBER and W. W. WATSON (J. Opt. Soc. Amer., 1936, 26, 307—309).— $\lambda\lambda$ accurate to 0.01 Å. for 48 lines are tabulated. Results are in close agreement with those of Boyce (cf. A., 1935, 799).

N. M. B.

Attempt to detect the presence of metastable atoms in active nitrogen by light absorption. W. S. HERBERT, G. HERZBERG, and G. A. MILLS (Canad. J. Res., 1937, 15, A, 35—38).—The N emission lines 1492 and 1742 Å. were not absorbed by active N and hence the concn. of 2D and 2P atoms is $<1/6000\%$ of the active N. From the Cario-Kaplan theory the concn. of metastable $^3\Sigma$ mols. in active N is calc. to be $>0.003\%$, with 1% of normal atoms.

R. S. B.

Effect of configuration interaction on the low terms of the spectra of oxygen. D. R. HARTREE and B. SWIRLES (Proc. Camb. Phil. Soc., 1937, 33, 240—249).—Theoretical. The magnitude of the effect of configuration interaction is sufficient to account for differences between observed intermultiplet separations and those calc. on the assumption that each state can be adequately described by a single configuration. Configuration interaction should be taken into account in obtaining the equations of the self-consistent field from which the radial wave functions are derived.

A. J. M.

Rotation structure of $^4\Sigma \rightarrow ^4\Pi$ -bands. A. BUDÓ (Z. Physik, 1937, 105, 73—80).—Rotation analysis of the quartet bands of diat. mols. is discussed mathematically with special reference to O_2 . The 48 possible modes of transition for $^4\Sigma \rightarrow ^4\Pi$ are tabulated and a formula for the intensity distribution in the limiting cases is given.

H. C. G.

Separation of close spectral lines by the method of anomalous dispersion. F. T. HOLMES (J. Opt. Soc. Amer., 1936, 26, 365—366).—A column of vapour which absorbs strongly in the region between the $\lambda\lambda$ of the lines to be separated is used as the dispersive element of a "spectroscope." With Na vapour, the Zeeman effect of the Na D lines is shown.

N. M. B.

Influence of an electric field on the absorption spectrum of sodium. N. T. ZE and W. W. PO

(J. Phys. Radium, 1936, [vii], 7, 193—197).—Data are recorded for fields up to 2800 volts per cm.

H. J. E.

Hyperfine structure of the sodium D lines. K. W. MEISSNER and K. F. LUFT (Ann. Physik, 1937, [v], 28, 667—672).—Direct measurements of the structure of the D_1 line, using an electrically excited at. Na beam as light source, give for the $^2S_{1/2}$ and $^2P_{1/2}$ terms vals. of $\Delta\nu$ 0.0594 ± 0.0003 cm^{-1} and 0.0058 ± 0.0003 cm^{-1} , respectively. The corresponding vals. for the no. of nuclear magnetons are 2.08 and 1.96.

O. D. S.

New absorption spectrum of diatomic sulphur. H. CORDES (Z. Physik, 1937, 105, 251—264).—The banded absorption spectrum of the gas from an electric discharge in S-SO₂ mixture has been measured between λ 2488 and 3396 Å. and is ascribed to metastable S_2 mols. (cf. A., 1933, 1021, 1130). Data are discussed in relation to transitions between energy levels of the S mol.

H. C. G.

Emission band spectrum of chlorine-I. A. ELLIOTT and W. B. CAMERON (Proc. Roy. Soc., 1937, A, 158, 681—691).—The wave nos. of band heads and of maxima of the continuous spectrum are measured. The analysis proposed by Ota and Uchida (A., 1929, 118) is shown to be untenable; no alternative is suggested at present.

G. D. P.

New terms in the spark spectra of argon, A II and A III. T. L. DE BRUIN (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 340—348).—An extension of earlier work (cf. A., 1930, 650). New terms in the spectra of singly ionised A II and doubly ionised A III are recorded.

F. J. L.

Temperature shift of the potassium resonance lines. G. F. HULL, jun. (Physical Rev., 1937, [ii], 51, 572—574; cf. this vol., 103).—Sets of data at 270° and 90° show that both shift and half-width of the K resonance lines in absorption perturbed by N₂ pressures 1—15 atm. vary with temp. in the same manner. As the "relative density" of N₂ increases the effect of temp. decreases, and becomes unobservable above relative density 7. Results agree with Margenau's theory (cf. A., 1936, 3).

N. M. B.

Magnetic moment of the scandium nucleus. H. HOPFERMANN and H. WITKE (Z. Physik, 1937, 105, 16—20).—From analysis of the hyperfine structure of the $4s^2S_{1/2}$ terms of Sc III the magnetic moment of the Sc nucleus is 4.8 nuclear magnetons.

L. G. G.

Theory of the continuous absorption spectrum of bromine. N. S. BAYLISS (Proc. Roy. Soc., 1937, A, 158, 551—561).—Wave-mechanical treatment of

absorption by a diat. mol. leads to an expression involving only two arbitrary consts. When applied to Br, satisfactory agreement with experiment is obtained.

Hyperfine structure and Zeeman effect of the resonance lines of silver. D. A. JACKSON and H. KUHN (Proc. Roy. Soc., 1937, A, 158, 372—383).—The structure of the resonance lines of Ag is investigated by absorption in an at. beam, and resolution by a Fabry-Pérot étalon. Each line is found to have four components; the two inner are ascribed to ^{107}Ag , the two outer to ^{109}Ag . Nuclear magnetic moments are calc. A small isotope shift is observed. Observations of the Zeeman effect confirm the origin of the lines and the val. of the spin ($\frac{1}{2}$ for each isotope; cf. A., 1936, 916). G. D. P.

Displacement of principal series lines of rubidium by the addition of rare gases. N. T. ZE and C. S. YI (Physical Rev., 1937, [ii], 51, 567—571; cf. A., 1936, 1167). N. M. B.

Spectrum of ionised tellurium. S. G. KRISHNAMURTI (Proc. Roy. Soc., 1937, A, 158, 562—570).—A continuation of previous work (cf. A., 1935, 1183) on the classification of lines of Te III. Terms due to sp^3 , $6d$, and $7s$ configurations are identified. G. D. P.

Determination of the mechanical moment of the caesium nucleus from the inverse Zeeman effect of the hyperfine structure. T. FÖLSCHÉ (Z. Physik, 1937, 105, 133—163).—From the inverse Zeeman effect on the hyperfine structure of the 8943 Å. and the 8521 Å. lines, $I = 7/2$. At the field strength used, about 5000 gauss, good agreement is obtained between theory and practice, in respect also of forbidden components at high field strengths. L. G. G.

Zeeman effect of doubly ionised cerium, Ce III. T. L. DE BRUIN, J. N. LIER, and H. J. VAN DE VLIET (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 334—339).—Arc and spark spectra of Ce III (λ 3500—2900 Å.) are analysed. Terms are identified. F. J. L.

Regularity in the structure of atomic nuclei, and determination of the quadrupole moments of ^{187}Re and ^{185}Re . H. SCHÜLER and H. KORSCHING (Z. Physik, 1937, 105, 168—174).—Hyperfine structure measurements on the 4946 Å. line of the Tl II spectrum, the 4889 and 5275 Å. lines of the Re I spectrum, and the 5782 Å. line of the Cu I spectrum show that whilst the nuclei ^{203}Tl , ^{205}Tl , ^{185}Re , ^{187}Re , and ^{63}Cu , and ^{65}Cu possess, respectively, equal mechanical moments, their magnetic moments show a minimum variation given by $\mu_{u+} = M_{u+2}/M_u$, where u is the mass no. of the lighter isotope and μ = magnetic moment. This is general for at. nuclei containing an even no. of neutrons and an odd no. of protons, and the corresponding isotopic nuclei formed by the introduction of 2 neutrons. The above Re lines have sufficient isotopic shift to allow separate determination of the magnetic moment. The quadrupole moment for ^{187}Re is 2.6×10^{-24} (elongated nucleus). Contrary to the behaviour of the magnetic moment, absorption of 2 neutrons in a nucleus reduces the quadrupole moment a few %. L. G. G.

Fine structure in the arc spectrum of platinum. (A) Nuclear spin of ^{195}Pt . (B) Even isotope displacement. S. TOLANSKY and E. LEE (Proc. Roy. Soc., 1937, A, 158, 110—127; cf. A., 1936, 772).—36 lines of the Pt spectrum, excited in a H_2O -cooled hollow cathode, have been examined for fine structure. The $5d^8$ and $5d^9$ electron groups have an appreciable coupling with the nucleus. All the terms observed exhibit even isotope displacement. In all the displacements ^{194}Pt lies deepest and the centre of gravity of the 195 pattern is not midway between the lines 194, 196, but nearer to 194. The val. of the even isotope displacement appears to be determined by the degree of penetration exhibited by any penetrating electrons in the term electron configuration. The displacements are not a function of J . G. D. P.

Absolute concentration of excited atoms in a low-pressure mercury discharge. V. FABRIKANT, F. BUTAJEVA, and I. CIRG (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 423—426; cf. this vol., 158).—By measuring the absorption in the discharge of visible triplet lines ending at the levels $6^3P_{0,1,2}$, the concns. at these three levels were determined, and results are discussed in relation to available calc. data. N. M. B.

Pressure broadening of spectral lines and van der Waals forces. I. Influence of argon on mercury resonance line. II. Continuous broadening and discrete bands in pure mercury vapour. H. KUHN (Proc. Roy. Soc., 1937, A, 158, 212—229, 230—241).—I. Measurement of the intensity distribution in the wings of the Hg line 2537 Å. broadened by A at different pressures proves the validity of the C/r^6 potential law for internuclear distances between 3.4 and 4.8×10^{-8} cm.

II. The broadening of the absorption line 2536.5 Å. of Hg vapour under the influence of its own pressure is measured, confirming the above results. The total absorption of the band system 2540 Å. is measured and yields a val. for the concn. of Hg_2 mols. The heat of dissociation of Hg_2 is calc. as > 2.1 g.-cal. G. D. P.

Spectrum of rubidium in the mercury arc. I. A. BALINKIN and D. A. WELLS (J. Opt. Soc. Amer., 1936, 26, 77—78).—Work previously reported (cf. A., 1933, 439) is extended to a Rb-Hg amalgam lamp. A spectrogram showing the emission lines of Rb and Hg at full glow was obtained. N. M. B.

New terms in the second spark spectrum of Hg III. R. RICARD (J. Phys. Radium, 1936, [vii], 7, 315—317).—Data for certain lines in the visible and near ultra-violet spectrum are classified. H. J. E.

Spectrum of trebly-ionised lead, Pb IV. M. F. CRAWFORD, A. B. MCLAY, and A. M. CROOKER (Proc. Roy. Soc., 1937, A, 158, 455—463).—The lines of the spectrum of Pb IV in the range 4000—9000 Å. are classified. G. D. P.

Wave-length identification lists for the extreme ultra-violet. J. C. BOYCE and H. A. ROBINSON (J. Opt. Soc. Amer., 1936, 26, 133—143).—A tabular compilation of available data. Lines likely to be

present in gas discharges, lines arising from the common constituents of glass, and the principal line or groups of lines of each of the first five spectra of a no. of elements are included. N. M. B.

Sparking potential curves for ionisation by collision of the second kind. R. ZOUKERMANN (Compt. rend., 1937, 204, 964—966; cf. A., 1933, 656; 1935, 1438).—The variation of the sparking potentials with pressure for A and N₂, alone and in presence of Hg, has been investigated. The results are discussed in relation to the mechanism of the discharge. A. J. E. W.

Mechanism of the discharge in the Siemens ozone tube. A. KLEMENC, H. HINTENBERGER, and H. HOFER (Naturwiss., 1937, 25, 249).—No high-frequency oscillations were found in the discharge current of the tube. A. J. M.

Altitudes and spectra of red and sunlit auroras. C. STÖRMER (Nature, 1937, 139, 584).—Principal results for the spectra of various auroras are given. L. S. T.

Electronic origin of nitrogen bands in the spectrum of the aurora borealis. Energy of the exciting electrons. R. BERNARD (Compt. rend., 1937, 204, 993—995).—Comparison of the spectrum with N spectra excited by electronic collisions (this vol., 207) shows that the radiation of N bands by the aurora is due to electrons of energy 27 e.v. A. J. E. W.

Absorption of oxygen at the limit of the solar spectrum. L. HERMAN (Compt. rend., 1937, 204, 1035—1037).—Data are given for the optical density of a column of O₂ 100 m. long, at 18°/27.7 kg. per sq. cm., for $\lambda\lambda$ between 2820 and 3050 Å. The absorption of solar radiation in this λ range by atm. O₂ is negligible. A. J. E. W.

Spectrum of Nova Lacertæ 1936, shortly after maximum brilliancy. (Mlle.) M. BLOCH (Compt. rend., 1937, 204, 1055—1056).—Lines attributed to H, He, N, C, O, Na, Ca, Si, Sc, Ti, Fe, Sr, Y, and Ba were observed. A. J. E. W.

Structure of the X-ray K absorption limits of bromine, iodine, and some of their compounds. B. CIOFFARI (Physical Rev., 1937, [ii], 51, 630—637).—Using the double-crystal spectrometer an investigation was made of the structure, width, and relative positions of the K absorption limits of Br (solid, liquid, and vapour), I (solid and vapour), and of HBr, MeBr, Br-H₂O, aq. and solid KBr, IBr (solid and vapour), HgI₂, CdI₂, SnI₄, KIO₃, and KI. Absorption curves are given, and widths and relative displacements of limits and positions of secondary structure are tabulated and discussed. N. M. B.

X-Ray fluorescence yields. R. J. STEPHENSON (Physical Rev., 1937, [ii], 51, 637—642).—The X-ray fluorescence yields for the K shell, measured by an ionisation-chamber method, for Ni, Cu, Zn, Se, Zr, Mo, Rh, Ag, Cd, and Sn show an increase with at. no., and results are compared with available data and with vals. calc. by relativistic and non-relativistic wave mechanics. The fluorescence yield

for the L_{III} shell of Pb, Th, and U has been determined, and shows an increase with at. no.

N. M. B.

Relative probability of excitation of the three L levels of tungsten as a function of the velocity of the cathode rays. W. J. HUIZINGA (Physica, 1937, 4, 317—324).—For tensions > twice the crit. tension the probability of excitation of the level of W increases relative to that of the L_{II} and L_{III} levels when the velocity of the exciting cathode rays increases. H. J. E.

Simultaneity of the absorption of the primary quantum and of the emission of secondary rays in the Compton and photo-electric effects. A. PICCARD and E. STAHEL (J. Phys. Radium, 1936, [vii], 7, 326—328).—Using the revolving-disc method it is shown that the absorption of a γ -ray in the Compton effect is accompanied by the emission of a recoil electron and a diffused quantum. Similar behaviour is found in the photo-electric effect. W. R. A.

Auger effect in xenon and krypton. L. H. MARTIN and F. H. EGGLESTON (Proc. Roy. Soc., 1937, A, 158, 46—54).—A statistical determination by means of a Wilson expansion chamber gives the K yields of Xe (0.78) and Kr (0.53). In the case of Xe the ejection of K and L electrons from the same atom is accompanied by the ejection of two M electrons. G. D. P.

Modification of apparent thermionic constants for oxygenated tungsten by temperature variation of adsorptive equilibrium. M. C. JOHNSON and F. A. VICK (Proc. Roy. Soc., 1937, A, 158, 55—68).—It is shown that the temp. coeffs. of chemical reaction at a composite surface will cause changes in the plot of thermionic emission; these changes lead to the measurement of slopes and intercepts which do not coincide with and are not even intermediate between the thermionic consts. of the bare or covered surface. The "anomalous" consts. of oxygenated W are examples. Further applications of the method of investigation are suggested. G. D. P.

Theory of the atomic photo-electric effect. F. RENNER (Ann. Physik, 1937, [v], 29, 11—24).—A mathematical discussion of photo-emission in relation to the work of Wentzel, Fischer, and Sauter. A. E. M.

Effect of oxygen on the photo-electric thresholds of metals. H. C. RENTSCHLER and D. E. HENRY (J. Opt. Soc. Amer., 1936, 26, 30—34; cf. A., 1933, 202).—The following threshold vals. have been determined: Mo 2850 approx., Pt <2000, Fe 2680 approx., Ni 2550, Cr 2840, Bi 2870 Å. A small amount of O₂ reacting with the active surface of Th, U, Ca, Ba, and Cs shifts the threshold to longer λ , and with Ti, Zr, Ag, Fe, and Ni, to shorter λ . For Au there is no change. The effect is attributed to the activity of the interaction product. N. M. B.

Energy distribution of photo-electrons emitted by calcium and calcium oxide. I. LIBEN (Physical Rev., 1937, [ii], 51, 642—647).—With careful elimination of contact potentials, measurements were made, with the aid of a magnetic velocity analyser, of the

energy distribution of the photo-electrons from pure Ca using λ 2536 radiation. Energy distribution curves for Ca, CaO, and intermediate stages were obtained. Data for Ca agreed with theory on the high- but not on the low-energy side. The photo-electric work function for pure Ca was 3.21 e.v.

N. M. B.

Critical potentials of secondary emission. R. WARNECKE (J. Phys. Radium, 1936, [vii], 7, 318—320).—There is a correspondence between crit. potentials observed in the secondary emission of Al, W, Ta, and Ni and vals. corresponding with the known energy levels.

H. J. E.

Secondary emission of pure metals. R. WARNECKE (J. Phys. Radium, 1936, [vii], 7, 270—280).—Secondary emission curves (0—1500 volts) are recorded for W, Ta, Mo, Ni, Cu, Al, Ag, Au, and Nb.

H. J. E.

Secondary electron emission of solids. R. KOLLATH (Physikal. Z., 1937, 38, 202—223).—A review.

A. J. M.

Secondary electron emission of soot in valves with oxide cathode. H. BRUINING, J. H. DE BOER, and W. G. BURGERS (Physica, 1937, 4, 267—275).—Ba atoms evaporated on to a soot surface were shown, from the secondary emission, to migrate into the interior of the soot layer. Migration was more rapid with soot deposited from a flame than with a deposit formed by spraying an EtOH suspension. The migration is caused by electron bombardment.

H. J. E.

Wave theory of positive and negative electrons. A. PROCA (J. Phys. Radium, 1936, [vii], 7, 347—353).—Mathematical. A theory is developed which combines simultaneously the characteristics of those of Gordon and Dirac.

W. R. A.

New process of negative ion formation. II. III. Energy distribution of negative ions and accommodation coefficients of positive ions. F. L. ARNOT (Proc. Roy. Soc., 1937, A, 158, 137—156, 157—166; cf. A., 1936, 1042).—II. An extension of the previous work on Hg vapour to H_2 , N_2 , O_2 , and CO_2 . Only monat. negative ions are found in H_2 and N_2 . O_2 gives both diat. and monat. ions. For positive ions of 180 volts energy the probability of conversion into a negative ion lies between 10^{-5} and 10^{-3} , depending on the negative ion formed.

III. The energy distribution of positive ions rebounding as negative ions from a Ni surface has been measured, for ions formed in H_2 , N_2 , O_2 , and CO_2 . The negative ions leave the surface on which they are formed with a wide range of energy. Accommodation coeffs. for positive ions are calc. and are shown to have an extended range of vals. with one, or sometimes two, most probable vals.

G. D. P.

Ionic impact at strict resonance. F. WOLF (Ann. Physik, 1937, [v], 29, 33—47).—Measurements of the effective cross-section of the ions Ne^+ , He^+ , A^+ , N_2^+ , and H_2^+ in the recharging reaction by which they are converted into uncharged mols. are reported and discussed.

H. C. G.

Photo-electric cross-section of the deuteron. (Miss) K. WAX (Physical Rev., 1937, [ii], 51, 552—

556).—Comparison of photo-electric cross-section curves for a Majorana-Heisenberg type potential and a velocity-dependent potential (cf. A., 1936, 1442) with the cross-section curve for a square hole Majorana force (cf. Breit, this vol., 105) shows that the cross-section vals. for the first two are consistent, but differ considerably from the third. A general formula, valid for exchange and for ordinary forces, for the area under the curve is derived.

N. M. B.

Chemical at. wts. and the relative abundance of the oxygen isotopes. G. M. MURPHY and P. F. BRANDT (J. Chem. Physics, 1937, 5, 274).—Comparisons, on the scale $O = 16$, between chemical and physical at. wts. are vitiated by the uncertainty regarding the relative abundance of the O isotopes, and it is suggested that a conversion factor derived from the chemical and physical at. wt. of He should be employed. This would mean that physical at. wts. = 1.00054 times chemical at. wts. of all light elements. The conversion factor on the O scale is 1.00025. The new conversion factor is used in converting physical at. wts. of He, F, Al, and P and gives vals. in good agreement with chemical at. wts. except for P, for which the old conversion factor gives a better val. The conversion factor is used to determine the relative abundance of the O isotopes, and it appears that ^{17}O and ^{18}O are more abundant than previous estimates. If, however, the generally accepted abundance ratio of the O isotopes is right, the chemical at. wts. of He, Al, and F are apparently wrong.

W. R. A.

At. wt. of erbium. II. O. HONIGSCHMID and F. WITTNER (Z. anorg. Chem., 1937, 232, 113—118; cf. A., 1933, 1099).—By analysis of $ErCl_3$ and making allowance for the presence of small quantities of other rare earths, the at. wt. of Er is 167.2.

E. S. H.

At. wt. of radiogenic leads. G. P. BAXTER, J. H. FAULL, jun., and F. D. TUENMILLER (J. Amer. Chem. Soc., 1937, 59, 702—705).—The at. wts. of specimens from different sources vary between 206.04 and 206.34. Several % of common Pb (207.21) are present.

E. S. H.

At. wt. of lead from galena, Great Bear Lake, N.W.T., Canada. J. P. MARBLE (J. Amer. Chem. Soc., 1937, 59, 653—655).—The at. wt. is 207.21. The constancy of at. wt. of common Pb is discussed in relation to geological age.

E. S. H.

Search for element 87. F. R. HIRSH, jun. (Physical Rev., 1937, [ii], 51, 584—586).—Available data are surveyed critically. Oscillation of the crystal used by Papish (cf. A., 1931, 1348) proved that the lines originally reported were due to a crystal defect.

N. M. B.

Absorption method for determining the limit of the continuous β -spectrum of radium-E. (MLLE.) A. BASCHWITZ (J. Phys. Radium, 1936, [vii], 7, 37—39).—The upper limit of the energy of a bundle of β -rays from Ra-E is obtained by absorption, using bakelite and Al screens of various thicknesses. The results, which are approx., depend on distance of specimen from measuring instrument. Scattering

in the absorber produces progressively inconsistent results as its at. no. increases. F. J. L.

Series of nuclear levels. W. M. ELSASSER (J. Phys. Radium, 1936, [vii], 7, 312—314).—An analysis of the energy groups in the α -ray spectrum of Ra-C'.

H. J. E.

Precise measurement of three radium-B β -particle energies. F. T. ROGERS, jun. (Physical Rev., 1937, [ii], 51, 588; cf. A., 1936, 1313).—A correction. N. M. B.

Absolute intensities of the strong β -ray lines of Ra (B + C), Th (B + C), and Ac (B + C). K. T. LI (Proc. Roy. Soc., 1937, A, 158, 571—580).—Measurements by a photographic method confirm the results of Ellis and Aston (A., 1930, 1339) for the three Ra-B lines, and also Gurney's result (A., 1926, 5) for the ratio of Ra-B, H to Th-B, F. A val. is obtained for the internal conversion coeff. for the strong γ -ray line of Ac-C. G. D. P.

β - and γ -Radiations of members of the actinium family. J. SURUGUE (J. Phys. Radium, 1936, [vii], 7, 337—346).—The γ -radiation of Ra-Ac, Ac-X, actinon and its active deposit have been studied. The discontinuous β spectra of these substances have been investigated by a method of focalisation. For Ra-Ac and Ac-X > 50 new β -rays are recorded. The 23 γ -rays of Ra-Ac enable the construction of a scheme of nuclear energy levels very close to that deduced from a study of the α -rays, whereas with the 14 γ -rays of Ac-X the scheme of energy levels is not completely confirmed by the observations on the α -rays. Actinon gives 8 γ -rays. W. R. A.

Anomalous phenomena in the scattering of fast β -particles. D. V. SKOBELZYN (Bull. Acad. Sci. U.R.S.S., 1936, 651—661; cf. A., 1936, 540).—The coeffs. of scattering by N₂ of β -particles with velocities of the order of 1500—2000 kv. are vals. deduced from Mott's formula. The effective cross-section for scattering is 10⁻²² sq. cm. A similar but smaller anomaly was observed at velocities of 500 kv.

O. D. S.

End-points of the β -ray spectra of radium-E and uranium-X₂. A. G. WARD and J. A. GRAY (Canad. J. Res., 1937, 15, A, 42—44).—The end-points of the β -ray spectra of Ra-E and U-X₂ are 5250 and 9300 gauss cm., respectively. R. S. B.

Absorption curves and ranges for homogeneous β -rays. J. S. MARSHALL and A. G. WARD (Canad. J. Res., 1937, 15, A, 39—41).—The absorption of β -rays from Ra-E and U-X has been determined in Al. R. S. B.

Quantitative interpretation of the γ -radiation diffused by the radiator in lead. E. STAHEL, H. KETELAAR, and P. KIPFER (J. Phys. Radium, 1936, [vii], 7, 379—388).—The component hardness of the γ -radiation diffused by lead can be interpreted qualitatively and quantitatively by the γ -radiation impulse caused by the same radiator as produces the rapid secondary electrons. The materialisation of positrons is also discussed. W. R. A.

Diffusion of γ -rays without change of wavelength. E. STAHEL and H. KETELAAR (J. Phys.

Radium, 1936, [vii], 7, 389—390).—The radiation diffused by Pb at 120° when submitted to the radiation of Ra has been studied, especially a very hard fraction of unchanged λ which is exhibited only with filters of Pb > 4 cm. thick. The experimental data are compared with the theoretical considerations of Franz (A., 1936, 264). W. R. A.

Scattered γ -radiation. H. KETELAAR (J. Phys. Radium, 1936, [vii], 7, 243—247).—Data are recorded for the scattering of γ -radiation from a 7-g. Ra source by Pb. A hard component (absorption coeff. — 0.4 per cm. of Pb) was observed in the scattered radiation. The effect of filtering the primary radiation was studied. H. J. E.

Fourth radioactive family. I. JOLIO-CURIE (Bull. Acad. Sci. U.R.S.S., 1936, 645—649; cf. A., 1935, 1050).—A lecture discussing the formation of the 4n + 1 family from Th bombarded by neutrons. O. D. S.

Regularities in the nuclear levels of radioactive atoms. S. ROSENBLUM and M. GUILLON (Compt. rend., 1937, 204, 975—977; cf. A., 1931, 280; 1936, 657; this vol., 160).—Cases of disintegration accompanied by the emission of β -rays are discussed in relation to the existence of nuclear energy levels.

A. J. E. W.

Quantitative study of pleochroic haloes. III. Thorium. G. H. HENDERSON, C. M. MUSHKAT, and D. P. CRAWFORD (Proc. Roy. Soc., 1937, A, 158, 199—211; cf. A., 1934, 1087).—Haloes due to Th in biotite from Star Lake, Manitoba, and from Pierrepont, St. Lawrence Co., N.Y., are measured by means of the halo photometer. The ranges are in good agreement with accepted vals. and that found for Th, 2.53 cm. in air at 15°/760 mm., confirms the magnitude of this const. A ring of undetermined origin and short range (1.18 cm. in air) is observed. G. D. P.

Neutron absorption in aqueous solution. W. H. FURRY (Physical Rev., 1937, [ii], 51, 592; cf. A., 1936, 1172).—An application of the theory of the determination of an element's resonance absorption of slow neutrons by measurements of the activation of an aq. solution is developed. N. M. B.

Magnetic scattering of neutrons. J. S. SCHWINGER (Physical Rev., 1937, [ii], 51, 544—552).—Mathematical. Assuming, in addition to the ordinary nuclear forces, a magnetic interaction between the neutron and the at. electrons, the neutrons scattered from an unpolarised beam will be partly polarised by virtue of this magnetic interaction, and the polarisation can manifest itself by a second scattering. Expressions are derived for neutron intensity after double scattering from magnetised Fe plates, and for the intensity and spin density of a neutron beam after traversing magnetised Fe. N. M. B.

Inelastic scattering of fast neutrons. D. C. GRAHAME, G. T. SEABORG, and G. E. GIBSON (Physical Rev., 1937, [ii], 51, 590—591; cf. this vol., 211).—Measurements by a method precluding scattering and changes in the energy spectrum of the neutrons show that, unlike slow neutrons, fast neutrons are not absorbed in the excitation of soft γ -rays with Fe, Cu, and Pb absorbers; they lose, however, much of their

ability to excite γ -rays in Pb, and are slowed down. It is concluded that many of the collisions of fast neutrons with nuclei are inelastic, leaving the nucleus in an excited state; the energies of the γ -rays subsequently emitted correspond with the energies of these low lying nuclear states. N. M. B.

Absorption of slow neutrons at low temperatures. A. I. LEIPUNSKI (Bull. Acad. Sci. U.R.S.S., 1936, 687—691).—The mean free path of neutrons in paraffin has been found to be 1.3 ± 0.2 cm. for energy 150 kv. and 1 ± 0.5 for energy 30 kv. Vals. are in agreement with theory. The absorption of group C neutrons in Ag and B has been measured at 290° , 77° , and 20.4° abs. The ratio of the thicknesses of equal absorbing layers at different temp. is const., but is $<$ the theoretical val. O. D. S.

Transformation of boron by slow neutrons. E. FÜNFER (Ann. Physik, 1937, [v], 29, 1—10).—A counter, checked by the known Sm α -radiation, is used for studying the transformation of B and for ionisation measurements on the short-range residue from B after absorption of slow neutrons. L. G. G.

Slow neutrons. H. VON HALBAN, jun., and P. PREISWERK (J. Phys. Radium, 1937, [vii], 8, 29—40).—Experiments with neutrons retarded by passage through paraffin are described and discussed, with a view of elucidating the mechanism of the retardation and the capture of neutrons. Neutrons passing through paraffin come into thermal equilibrium with the protons of the paraffin, and emerge as neutrons with thermal energy, the amount of which can be varied by altering the temp. of the paraffin. Cd acts as a filter for such neutrons, strongly absorbing neutrons with thermal energy, but being transparent to neutrons of greater energy. The effective section of Rh, Ag, and I for thermal neutrons is inversely \propto speed of neutrons, but these elements also absorb considerably the more rapid neutrons. Neutrons of different speeds are selectively absorbed by different elements, and are known as "resonance" neutrons. Those from I contain more energy than those from Ag, and it is possible to arrange the elements in the order of such energies, e.g., Br (18 min.) $>$ I $>$ Ag (22 sec.) $>$ Rh (45 sec.) $>$ In $>$ Ir. The effective cross-section of B for resonance neutrons is inversely \propto speed of neutrons over a wide range. The energies of resonance neutrons of various nuclei are 1—200 volts. The form of the resonance levels is discussed. The levels are similar to those responsible for the lines of the at. spectra, and the reversal of lines can be observed when the same element is used as absorber and detector. If neutrons are associated with a wave-motion, the slower neutrons would have λ $1 - 3 \times 10^{-8}$ cm., and it should be possible to observe diffraction phenomena. Qual. experiments are described which demonstrate this diffraction. A. J. M.

Detection of slow neutrons in the atmosphere. E. FÜNFER (Naturwiss., 1937, 25, 235).—Apparatus is described by means of which it is shown that slow neutrons occur in the atm. at the rate of about 2 per hr. per sq. cm. It is improbable that these neutrons

are due to radioactive radiation. They are probably slowed-down neutrons from the stratosphere.

A. J. M.

D-D nuclear reaction. H. KALLMANN and E. KUHN (Naturwiss., 1937, 25, 231—232).—The nuclear reaction ${}^2\text{D} + {}^2\text{D} = {}^3\text{He} + {}^3\text{n}$ was investigated by causing accelerated ions in a positive-ray tube filled with D_2 to impinge on a film containing D_2O . The no. of slow and rapid neutrons evolved was measured and compared with those from a standard Ra-Be source. A. J. M.

Study of transmutation in the chemical laboratory. F. A. PANETH (J.C.S., 1937, 642—654).—A lecture. A. J. M.

Disintegration energy of artificial radioactive nuclci. G. J. SIZOO (Physica, 1937, 4, 316).—Theoretical. H. J. E.

Range of groups of natural H-radiation. W. VOLLAND (Z. Physik, 1937, 105, 104—113).—Particle counts on H-radiation resulting from Po α -ray bombardment of $\text{C}_{23}\text{H}_{60}$ in layers 10μ thick show that minima occur at two vals. of the α -particle velocity, viz., 1.09 and 1.33×10^9 cm. per sec. Deviations from classical scattering are discussed wave-mechanically. L. G. G.

Theory of β -disintegration and nuclear forces. E. TAMM (Bull. Acad. Sci. U.R.S.S., 1936, 681—685).—Mathematical. O. D. S.

Influence of the charge of a nucleus on the form of its β -spectrum. B. S. DZELOPOV (Bull. Acad. Sci. U.R.S.S., 1936, 673—679).—The energy distribution in the β -spectrum has been investigated down to 100 e.kv. for ${}^{23}\text{Al}$, ${}^{15}\text{P}$, and ${}^{15}\text{Eu}$, and down to 22 e.kv. for Ra-E (${}^{214}\text{Bi}$). The curves for P, positron disintegration, and for Al, electron disintegration, are similar in configuration. A relatively greater no. of slow electrons was observed in the spectrum of Ra-E. Results agree with theory. O. D. S.

Production of pairs by γ -rays and the internal conversion of γ -rays. A. ALICHANIAN (Bull. Acad. Sci. U.R.S.S., 1936, 663—672; cf. A., 1934, 1150).—Investigation of the spectrum of positrons emitted by Ra-C shows the presence of a new line in the γ -ray spectrum of Ra-C with energy 2470 e.kv. and intensity 2% of the no. of disintegrating nuclei. Evidence was also obtained of an internal conversion with formation of positrons for the γ -ray line 1380 e.kv. The spectra of positrons produced by illuminating thin films of Pb, Sn, and Cu are asymmetrical, the asymmetry increasing with increasing at. no. S

Formation of helium from α -radiators. I. Formation of helium on bombardment of substances with the unfiltered radiation from thorium-B + C. P. L. GUNTHER (Z. physikal. Chem., 1937, B, 35, 331—342).—With Hg, Sn, and I the amount of He formed corresponds with the no. of α -particles received, but with C, S, Na, H_2O , and hydrocarbons a 20—46% excess of He appears. R. C.

Disintegration of ${}^8\text{Li}$. G. BRETT and E. WIGNER (Physical Rev., 1937, [ii], 51, 593; cf. this vol., 108).—Evidence supporting the disintegration into

two α -particles of the residual ^8Be nucleus from the β -ray disintegration of ^8Li is discussed. N. M. B.

Induced radioactivity in light atomic nuclei by bombardment with α -rays. A. MEYER (Z. Physik, 1937, 105, 232—250).—Induced radioactivity in Al, Mg, and N excited by bombardment with α -rays from Ra-C was examined with an ionisation chamber containing CO_2 . Radioactive isotopes ^{30}P , ^{28}Al , ^{27}Si , and ^{17}F arise from Al, ^{25}Mg , ^{24}Mg , and N, respectively. Vals. obtained for half-life periods, resonance levels, and radiation energies were in good agreement with those obtained by other workers using the counter tube method. The relative nos. of activated particles were also determined in each case. H. C. G.

Activation of rhodium, silver, and copper with neutrons. H. K. MÜLLER (Naturwiss., 1937, 25, 251—252).—In contrast to the usually accepted vals. and in agreement with Döpel (A., 1936, 264) the half-life periods of Rh activated by neutrons are 35 ± 1 sec. and 3.8 ± 0.1 min. A weak product of half-life period of several hr. was also found. The processes are $^{103}\text{Rh} + \frac{1}{2}n \rightarrow ^{104}\text{Ru} + \frac{1}{2}H^+ \rightarrow ^{103}\text{Rh} + e (+\gamma)$ for the 35 sec. nucleus, and $^{103}\text{Rh} + \frac{1}{2}n \rightarrow ^{104}\text{Rh} \rightarrow ^{104}\text{Pd} + e$ for the 3.8 min. nucleus. The effect of filtering the neutrons through H_2O on the activation was examined. Half-life vals. for the radioactive products from Ag have been confirmed. With Cu, the only product had half-life 6.1 ± 0.2 min. A. J. M.

Radioactivity induced in silicon and phosphorus by deuteron bombardment. H. W. NEWSON (Physical Rev., 1937, [ii], 51, 624—627).—Bombardment with 3 m.e.v. deuterons caused the reactions $^{30}\text{Si} + ^2\text{D} = ^1\text{H} + ^{31}\text{Si}$ (170 ± 10 min.) and $^{31}\text{P} + ^2\text{D} = ^1\text{H} + ^{32}\text{P}$ (14.5 ± 0.3 days). The absorption curves of the β -rays, absorbed in Al, showed sharp end-points from which the calc. max. energies of the β -ray spectra were 1.50 ± 0.01 for ^{31}Si and 1.59 ± 0.03 m.e.v. for ^{32}P , in satisfactory agreement with experiment (cf. Lyman, this vol., 107; Paxton, *ibid.*, 162). N. M. B.

Disintegration of cadmium with deuterons. J. M. CORK and R. L. THORNTON (Physical Rev., 1937, [ii], 51, 608—611).—The following reactions are postulated to explain the observations when a Cd target is bombarded with 6.3 m.e.v. deuterons: $^{114}\text{Cd} + ^2\text{H} \rightarrow ^1\text{H} + ^{115}\text{Cd}$ (4.3 hr.) $\rightarrow ^{115}\text{In} + \gamma$; $^{116}\text{Cd} + ^2\text{H} \rightarrow ^1\text{H} + ^{117}\text{Cd}$ (58 hr.) $\rightarrow \gamma + ^{117}\text{In}$ (2.3 hr.) $\rightarrow ^{117}\text{Sn}$ (stable). Identifications were by chemical analysis, and successive separations over 60 hr. showed ^{117}In to be in equilibrium with ^{117}Cd . N. M. B.

Transmutation functions at high bombarding energies. H. W. NEWSON (Physical Rev., 1937, [ii], 51, 620—623; cf. A., 1936, 132).—The differential transmutation functions of the reactions $^{12}\text{C} + ^2\text{D} = ^{13}\text{N} + ^1n$; $^{14}\text{N} + ^2\text{D} = ^{15}\text{O} + ^1n$; $^{16}\text{O} + ^2\text{D} = ^{17}\text{F} + ^1n$ have been measured for bombarding energies 2—5 m.e.v. All three curves showed a marked change of slope at the top of the potential barriers, corresponding with potential barrier heights 2.8, 3.2, and 3.1 m.e.v., respectively. The abs. cross-sections

for disintegrations at the top of the potential barrier are 4.0, 2.8, and 6.0×10^{-26} sq. cm., respectively. N. M. B.

Disintegrations produced by cosmic rays. J. SOLOMON (J. Phys. Radium, 1936, [vii], 7, 71—76).—Mathematical. The probability that electrons of high energy will produce nuclear disintegration accompanied by the emission of a heavy particle is shown to be very small. It is therefore improbable that fast protons observed at the earth's surface are due to such disintegrations. O. D. S.

Secondary particles from the penetrating component of the cosmic radiation. W. H. PICKERING (Physical Rev., 1937, [ii], 51, 628—629).—Some of the coincidences between three Geiger counters in line separated by thick Pb are not due to the passage of a single ionising particle, but to secondary particles released in the Pb near the counters. N. M. B.

Diurnal variation of cosmic-ray showers. M. FORRÓ (Nature, 1937, 139, 633—634).—The variation in intensity of cosmic ray showers, unlike the vertical rays themselves, is not related to the diurnal periodicity of the horizontal intensity of the earth's magnetic field. This indicates that the shower-producing primary radiation is not composed of electrically charged particles. L. S. T.

Studies of cosmic-ray showers by quintuple coincidences. H. C. SHAN (Proc. Roy. Soc., 1937, A, 158, 581—590).—Five Geiger-Müller tube-counters arranged in a regular pentagon are used to study cosmic-ray showers produced in Pb. The effect of the angle of divergence of the showers on the transition curve is investigated. The initial parts of the transition curves for Pb, Sn, Zn, and Al have been studied. When the rate of coincidences is plotted against nZ^2 , where n = no. of atoms per sq. cm. of the shower-producing material, and Z = at. no., the transition curves for different elements are the same. G. D. P.

Method of analysis of absorption curves of ultra-radiation. B. GROSS (Physikal. Z., 1937, 38, 201—202).—The principle of a method of obtaining the primary radiation curve from the general absorption curve of ultra-radiation is given. A. J. M.

Terrestrial origin of cosmic rays. M. C. HOLMES (J. Franklin Inst., 1937, 223, 495—500).—A proposed mechanism for cosmic ray origin is based on the orientation of the Debye H_2O mol. resulting in a negative terrestrial surface charge, which, with ionisation of the upper atm. by ultra-violet radiation from the sun, maintains the earth's electric gradient. This effects a vertical separation of positive and negative ions, and there is an additional horizontal separation by the poleward air currents. Approx. estimations are outlined. N. M. B.

Ionisation of dielectric liquids. Application to cosmic rays. M. C. BIALOBRZESKI (J. Phys. Radium, 1936, [vii], 7, 329—336).—The ions produced in the five hydrocarbons from C_5H_{12} to C_9H_{20} by X-rays are of three kinds, two positive and one negative; their mobilities (u) and coeffs. of recombination have been

determined; the negative ion has a u intermediate in val. between the vals. of the two positive ions. An equation connecting u and η is given. The dielectric liquids have been applied also to a study of the ionisation "kicks" produced by cosmic rays.

W. R. A.

Theory of internal pair production. H. YUKAWA and S. SAKATA (Proc. Phys.-Math. Soc. Japan, 1935, **17**, 397—407).—Internal pair production by radiationless S - S transitions of a radioactive nucleus will account for only a small part of the observed effect.

CH. ABS. (e)

Hartree and Hartree-Fock methods. N. H. FRANK (Physical Rev., 1937, [ii], **51**, 577—583).—Mathematical. Limitations of the methods for many-body problems and the importance of these limitations in nuclear structure theory are discussed. N. M. B.

Correction due to motion of centre of gravity in the Hartree approximation in nuclei. A. F. STEPHENSON (Physical Rev., 1937, [ii], **51**, 590; cf. Feenberg, this vol., 109; Bethe, *ibid.*, 215).—Considerations applicable to any type of one-particle wave function are discussed.

N. M. B.

Structure of light nuclei. E. FEENBERG and M. PHILLIPS (Physical Rev., 1937, [ii], **51**, 597—608; cf. this vol., 109).—Mathematical. Additional calculations for the nuclei between ${}^6\text{He}$ and ${}^{16}\text{O}$, based on the Hartree method, are given. N. M. B.

Perturbation theory of light nuclei: ${}^4\text{He}$ and ${}^6\text{Li}$. D. R. INGLIS (Physical Rev., 1937, [ii], **51**, 531—544).—Mathematical.

N. M. B.

Theory of charged elementary particles. H. HONL (Ann. Physik, 1937, [v], **28**, 721—760).—Basic wave equations are developed for the extension of Dirac's theory to include the proton and antiproton (proton with negative charge).

O. D. S.

Nuclear transformation with absorption of the orbital electron. H. YUKAWA and S. SAKATA (Physical Rev., 1937, [ii], **51**, 677—678).—Mathematical.

N. M. B.

Coulomb force between two neutral atoms. L. GOLDSTEIN (J. Phys. Radium, 1936, [vii], **7**, 466—468).—Mathematical. Using analytical forms similar to the functions for the statistical distribution of at. charge and potential (Thomas-Fermi atom), the Coulomb force between two identical neutral atoms (neglecting mutual polarisation) is evaluated in terms of the at. no. and the distance between the at. nuclei.

F. J. L.

Comparison of wave functions for the normal helium atom. T. D. H. BABER and H. R. HASSÉ (Proc. Camb. Phil. Soc., 1937, **33**, 253—259).—Some suggested wave functions of the normal He atom are compared as regards energy, magnetic susceptibility, and electrical polarisability.

A. J. M.

Helium wave equation. T. H. GRONWALL (Physical Rev., 1937, [ii], **51**, 655—669).—Mathematical. An attempt to solve the wave equation for He S -states.

N. M. B.

Connexion formulæ and solutions of the wave equation. R. E. LANGER (Physical Rev., 1937, [ii], **51**, 669—676).—Mathematical.

N. M. B.

Density of eigenfunctions for an electron obeying Dirac's equation. E. K. BROCH (Physical Rev., 1937, [ii], **51**, 586—588).—Mathematical.

N. M. B.

Generalised Fermi interaction. F. HOYLE (Proc. Camb. Phil. Soc., 1937, **33**, 277—292).—Mathematical.

A. J. M.

Non-adiabatic processes in inhomogeneous fields. J. SCHWINGER (Physical Rev., 1937, [ii], **51**, 648—651).—Mathematical. The Güttinger equations are incorrect. The corr. equations are applied to calc. transition probabilities between the various magnetic states of a field precessing with const. angular velocity.

N. M. B.

Energy differences in the addition of neutrons. S. KIKUCHI, K. HUSIMI, and H. AOKI (Z. Physik, 1937, **105**, 265—266).—A reply to Fleischmann (A., 1936, 1440).

L. G. G.

Theory of atomic diffusion phenomena. L. GOLDSTEIN (J. Phys. Radium, 1936, [vii], **7**, 255—262).

H. J. E.

Constitution of the ionosphere. R. JOUAUST (J. Phys. Radium, 1936, [vii], **7**, 289—296).

H. J. E.

Neutrino theory of light. II, III. P. JORDAN (Z. Physik, 1937, **105**, 114—121, 229—231; cf. A., 1936, 1176).—The relation between the wave amplitudes of light and neutrino fields is considered mathematically.

H. C. G.

Neutrino theory of light. M. H. L. PRYCE (Z. Physik, 1937, **105**, 127—132).—The energy of interaction between neutrino and matter is deduced from that between light and matter on the basis of Jordan's theory.

H. C. G.

Equation of the photon. J. J. PLACINTEANU (J. Phys. Radium, 1936, [vii], **7**, 127—132; cf. A., 1933, 995).—The photon is considered as composed of a Dirac electron and a positron. The properties of the equation deduced are considered.

O. D. S.

Relations between the second- and higher-order processes in the neutrino-electron field theory. M. H. JOHNSON, jun., and H. PRIMAKOFF (Physical Rev., 1937, [ii], **51**, 612—619).—Mathematical. The magnitude and range of the proton-neutron and proton-proton forces are deduced. The range of the latter force is $<$ that of the former, and there is a simple relationship between the magnitude of the P - P force and the range and magnitude of the P - N force. The calc. P - N force cannot exceed 0.4×10^{-13} cm. A treatment of an n -fold process in which a fast proton or neutron produces cosmic ray showers is given.

N. M. B.

Temperature measurement on freely burning carbon arcs by means of the CN band. W. LOCHTE-HOLTGREVEN and H. MAECKER (Z. Physik, 1937, **105**, 1—15).—The CN band (3883 Å.) is photographed through a bored anode. Calculations from intensities of the line give for a normally burning arc a temp. of 7600° abs., a slightly overloaded arc a temp. of 6700° abs., and for the strongly overloaded arc, temp. of 8700° abs. and over.

L. G. G.

Luminous flames. I. Absorption spectra of soot layers. II. Absorption spectra of luminous flames. S. YAGI (J. Soc. Chem. Ind. Japan, 1937, 40, 50—55B).—I. The visible and infra-red absorption spectra of layers of various soots, caught in flames on thin mica plates, can be expressed by $k = 39.5r^2N\lambda(1 - 15[\gamma\lambda]^2)$.

II. Flames made luminous by addition of C_6H_6 or C_2H_2 give infra-red absorption which can be expressed by $k = Cw(1 - 0.15v^2) \times 10^4$, where k — absorption coeff. of soot in cm^{-1} , r = radius of a soot particle in N — no. of particles per c.c., v = wave no. cm^{-1} , w = g. of C per c.c. of gas, and C is a const. C. R. H.

Energy of dissociation of the molecule of carbon monoxide. M. DE HEMPTINNE, J. SAVARD, and P. CAPRON (Compt. rend., 1937, 204, 1039—1041).—Observed crit. potentials for CO (cf. this vol., 170) are discussed. The energy of dissociation into $C^+ + O$ is 20 e.v. A. J. E. W.

Completion of the term system for carbon monoxide. I. Vibration terms and rotation constants of the $a',^3\Sigma^+$ -state. R. SCHMID and L. GERO (Z. Physik, 1937, 105, 36—44).—Vibration terms and rotation consts. of the $a',^3\Sigma^+$ -state are calc. from collected data and discussed. The limiting curve of dissociation for the $a',^3\Sigma^+$ -state is identical with the limiting curve of predissociation of the $b',^3\Sigma^+$ -state. H. C. G.

Band spectrum of manganese hydride, MnH. R. W. B. PEARSE and A. G. GAYDON (Nature, 1937, 139, 590; cf. A., 1936, 1177).—Bands in the red, yellow-green, green, and blue obtained in the spectrum of an electric discharge between Mn poles in a H_2 flame are attributed to MnH. The nature of the electronic transitions is discussed in relation to the levels of Mn. L. S. T.

Red band spectrum of nickel hydride. A. HEIMER (Z. Physik, 1937, 105, 56—72).—Analysis of new bands has increased the no. of known vibrational levels to 4 in the initial state and 2 in the final state. Term differences and doublet splitting are discussed. The isotope effect was investigated for all bands. H. C. G.

Gold deuteride bands. S. IMANISHI (Nature, 1937, 139, 591).—Preliminary vals. of the mol. consts. of AuD have been calc. from the arc spectrum obtained between Au electrodes in D_2 of high concn. at approx. 12 cm. pressure. 723 AuD lines between 3370 and 4440 Å. have been analysed into eleven bands of a \rightarrow system. The electronic isotope shift from the corresponding AuH system ($0 \rightarrow 0$, 3650 Å.) is +14 cm^{-1} . L. S. T.

Nature of the colour centres in alkali halide crystals. J. H. DE BOER (Rec. trav. chim., 1937, 56, 301—309).—Schottky's conception of "ionic voids" is adopted to explain ionic conduction and diffusion in alkali halide crystals. It is shown that the colour centres are neutral alkali atoms in close proximity to "halogen ionic voids." The no. of such voids which are in thermodynamical equilibrium with the lattice is dependent on temp. F. J. L.

Spectrum of mercury chloride ($HgCl$) and Samuel's theory of linkage. K. WIELAND (Nature, 1937, 139, 590—591).—Analysis of a spectrum of $HgCl$ vapour between 5600 and 3200 Å. supports the view that the ground state of the $HgCl$ mol. is built up from a Cl atom in its normal term and a Hg atom in its lowest term, 1^1S , and not from an excited atom. This does not agree with the views of Samuel *et al.* (cf. A., 1936, 272). L. S. T.

Absorption spectra of tri-iodides. C. B. ALLSOPP (Proc. Roy. Soc., 1937, A, 158, 167—181).—The absorption spectra of EtOH solutions of AsI_3 , SbI_3 , BiI_3 , and $SnMeI_3$ show maxima similar to those found in the spectra of solutions of CHI_3 . The influence of solvents on the absorption spectra of tri-iodides is investigated. The absorption maxima are ascribed to the same origin as those found in the spectra of the I^- ion, of adsorbed I mols., of the polyhalides of the alkalis, and of certain I derivatives of Te. G. D. P.

Absorption spectrum of copper sulphate in heavy water. A. I. BRODSKI and A. A. ZANKO (J. Phys. Chem. Russ., 1936, 8, 953—954).—The absorption by aq. solutions is stronger than that by solutions in 44% and 93% D_2O . J. J. B.

Absorption spectrum of potassium cobaltous thiocyanate. O. R. HOWELL and A. JACKSON (J.C.S., 1937, 621—626).—The absorption of aq. solutions of $CoCl_2$ with increasing $[KCNS]$ have been measured at 20°. The two principal bands are at 6200 and 5850 Å., and the variation of the extinction coeff. of these two bands with $[KCNS]$ has been plotted. The curves are similar to those obtained for the addition of HCl (A., 1936, 1047) and of $MgCl_2$ (*ibid.*, 1443) to $CoCl_2$, except that the concn. of the blue constituent increases right from the beginning. There is a rapid rise of the extinction coeff. as $[KCNS]$ increases, which later becomes a linear relationship, and ends abruptly at a concn. above which further addition of KCNS causes no change in the coeff. At these crit. concns. the ratio of (CNS) to (H_2O) is 1 : 4. At the beginning of the linear portion the complex present is $[Co(H_2O)_6CNS]^+$; at the end the substitution of H_2O by (CNS) is complete, and the complex is $[Co(CNS)_4]^{3-}$. The complete change is $[Co(H_2O)_6]^{2+}$ (red) $\rightarrow [Co(H_2O)_5CNS]^+$ (red) $\rightarrow [Co(H_2O)_4(CNS)_2]^{2-}$ (blue) $\rightarrow [Co(CNS)_4]^{3-}$ (blue). Examination of the subsidiary band at 5250 Å. indicates that $K_2[Co(CNS)_4]$ is very little ionised when its formation is first complete. The absorption of $[Co(CNS)_4]^{3-}$ is that of $[CoCl_4]^{2-}$. There is also a marked difference between the two principal valencies in $[Co(CNS)_4]^{3-}$ and great similarity between those in $[CoCl_4]^{2-}$. A. J. M.

Influence of solvents and of other factors on the rotation of optically active compounds. XXXIV. Influence of water and of deuterium oxide. C. BUCHANAN (J.C.S., 1937, 581—584).—The optical rotation of Me *d*-tartrate in D_2O (99%) is < that in H_2O , that of Me *d*-dimethoxysuccinate is the same in both solvents, whilst that of *l*-nicotine in D_2O is > that in H_2O . Nicotine is less sol. in D_2O than in H_2O at 60.5°. A. J. M.

Absorption spectra of praseodymium salts and their Zeeman effect. A. MERZ (Ann. Physik, 1937, [v], 28, 569—602).—The spectra of $\text{Pr}_2\text{Mg}(\text{NO}_3)_{12} \cdot 24\text{H}_2\text{O}$ (I), $\text{Pr}(\text{EtSO}_4)_3 \cdot 9\text{H}_2\text{O}$ (II), $\text{Pr}(\text{BrO}_3)_3 \cdot 9\text{H}_2\text{O}$, $\text{Pr}_2(\text{MoO}_4)_3$, $\text{Pr}(\text{C}_6\text{H}_5\text{Br}_2 \cdot \text{SO}_3)_3 \cdot 9\text{H}_2\text{O}$, and $\text{Pr}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ (III) have been investigated at liquid H_2 temp. and in magnetic field. The Zeeman effect and the variation of the no. of lines in the spectrum with the crystal symmetry of the compounds were found to agree qualitatively with the theory of Kramers and Bethe. The term classification of Gobrecht (this vol., 60) is confirmed and extended. The substitution of D_2O for H_2O in (III) causes slight displacements in the lines. Transition probabilities for the observed line groups in the spectra of (I), (II), and (III) were determined from measurements of the intensity of absorption, the vals. lying between 1.9×10^{-5} and 5.7×10^{-5} . O. D. S.

Absorption spectrum of the carboxyl group in the vacuum ultra-violet. W. M. EVANS and W. C. PRICE (Nature, 1937, 139, 630—631).—Discrete absorption bands of HCO_2H in the region 2000—1000 Å. are described and discussed.

L. S. T.

Absorption spectra. I. Crotonaldehyde and acraldehyde. F. E. BLACET, W. G. YOUNG, and J. G. ROOF (J. Amer. Chem. Soc., 1937, 59, 608—614).—Modified procedure for obtaining mol. extinction coeffs. is described. The ultra-violet absorption spectra of crotonaldehyde and acraldehyde in the vapour phase have been determined. *cis*-Crotonaldehyde does not appear to be present in the commercial product. E. S. H.

Differences in absorption curves of groups of unsaturated hydantoins.—See A., II, 211.

Ultra-violet absorption spectra of some complex aromatic hydrocarbons. II. W. V. MAXNEORD and E. M. F. ROE (Proc. Roy. Soc., 1937, A, 158, 634—650; cf. A., 1936, 267).—The spectra of a no. of polycyclic aromatic compounds in solution in EtOH, some of biological importance, have been studied. Technique of low-temp. measurements and results with C_6H_6 solutions are described. Preliminary experiments on C_{10}H_8 , anthracene, and phenanthrene are reported. G. D. P.

Influence of substituents on the ultra-violet absorption of doubly conjugated benzene chromophores. M. PESTEMER and E. MAYER-PITSCH (Monatsh., 1937, 70, 104—112; cf. A., 1936, 1318).—The absorption spectra of *o*-, *m*-, and *p*-amino-, *o*-, *m*-, and *p*-nitro-, and *o*- and *p*-cyanodiphenyl in various solvents have been measured in the region 20,000—45,000 cm^{-1} . The shift of the *A* band towards longer λ produced by substitution follows the order $o > m > p$ for the NH_2 -substituted Ph_2 , but the reverse order for NO_2 -substitution. The NH_2 -group loses its effect on addition of HCl. The *p*-substituted compounds show such a large shift of the *B* band towards longer λ that it merges with the *A* band. It is concluded that the *B* band is due to the action of the conjugation of the C_6H_6 chromophores. J. W. S.

Substitution and absorption band displacement. IX. Halogeno-anilines and -nitrobenzenes. G. FORSTER and J. WAGNER (Z. physikal. Chem., 1937, B, 35, 343—353; cf. A., 1936, 1178).—The band displacements of Cl- and Br-substituted anilines agree with the rule previously formulated (A., 1933, 445), but those of *p*- $\text{C}_6\text{H}_4\text{F} \cdot \text{NH}_2$ do not. The first principal band of the *o*- and *m*-halogeno-nitrobenzenes with a max. at 34,700 cm^{-1} is ascribed to the NO_2 chromophore. R. C.

Ultra-violet and infra-red spectra of thiophen, thiophthen, and thionaphthen. J. GODART (J. Chim. phys., 1937, 34, 70—93).—Infra-red absorption has been measured between 0.80 and 2.70 μ . The spectra of thionaphthen (I) and thiophthen (II) resemble those of C_6H_6 and C_{10}H_8 , respectively. The frequencies of (I) and thiophen (III) have been classified as harmonics of the Raman frequencies. In their ultra-violet absorption curves (III) and (II) resemble C_6H_6 and C_{10}H_8 , respectively. The ultra-violet frequencies of (III) vapour have been classified. R. C.

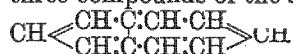
Optical absorption of imidoporphyrins. A. STERN and F. PRUCKNER (Z. physikal. Chem., 1937, 178, 420—436).—The absorption spectra of the mono- and di-imidoætioporphyrins have the same no. of bands in the visible as those of the porphyrins, and are only slightly influenced by β -substitution and the solvent. In these and the tetra-imidoporphyrins the red band I is intensified by an amount which approx. \propto the no. of C:N groups. Band III is also intensified. It is probable that in the imidoporphin system nuclei I and III have the pyrrolenine structure. There is some similarity in type between the absorption curve in the visible of tetraimidoætioporphyrin and that of phthalocyanine. The latter has two very strong bands at 698 and 664 μ , which are attributed to the chromophoric influence of the C:N groups in the ring system. R. C.

Behaviour of the 4930 Å. absorption band of uranine solutions under high pressure. W. J. LYONS (J. Opt. Soc. Amer., 1936, 26, 144—145).—*n* for the three principal lines of the Hg arc, and for λ corresponding with the absorption band max. (4930 Å.), were determined for two dil. aq. solutions of uranine of slightly different concns. for pressures > 915 and > 8123 kg. per sq. cm., respectively. The absorption band retained its position relative to the rest of the spectrum formed by the liquid prism under various pressures. Results indicate that the natural vibration frequency of resonators is not appreciably affected by the pressure or density of a medium, in agreement with electromagnetic dispersion theory. N. M. B.

Absorption spectra of datiscetin, morin, and quercetin. R. GRINBAUMOWNA and L. MARCHLEWSKI (Biochem. Z., 1937, 290, 261—268).—Absorption curves have been plotted for datiscetin (I), its Ac_4 , Bz_4 , and $(\text{PhSO}_3)_4$ derivatives, morin (II), and quercetin (III). (I), (II), and (III) exhibit two max. at 264 and 375, 263 and 371.5, and 255.5 and 375.5 μ , respectively. W. McC.

Volatile vegetable materials. VI. Absorption spectra of azulene, guaiazulene, and vetiv-

azulene. B. SUSZ, A. S. PFAU, and P. A. PLATTNER (Helv. Chim. Acta, 1937, 20, 469—477).—The absorption spectra of these compounds have been measured over the range 2300—7500 Å. Azulene and *S*-guaiazulene show const. frequency differences between their absorption max. in the visible region. The absorption spectra confirm the presence in the three compounds of the same group, viz.,



J. W. S.

Model of a vibrating molecule. W. H. J. CHILDS and H. A. JAHN (J. Sci. Instr., 1937, 14, 141—142).—A simple demonstration model of the C_6H_2 mol. is described. The three axial modes of vibration are excited by a series of air impulses timed by a simple pendulum of continuously adjustable period. At resonance with a normal frequency the latter vibration continues automatically.

N. M. B.

Investigations in the infra-red. II. Absorption spectrum of boric acid. M. K. SEN (Indian J. Physics, 1937, 11, 9—11).—The absorption spectrum of boric acid between 5 and 15 μ shows 8 bands, three of which are attributed to the BO_3 radical and have been reported previously for inorg. borates. The other bands are due to the mol., $\text{B}(\text{OH})_3$, and from its identity with the only recorded Raman frequency the band at 875 cm^{-1} is attributed to the totally symmetrical vibration of the mol. W. R. A.

Transmissions of powder films to the infra-red spectrum. J. H. PLUMMER (J. Opt. Soc. Amer., 1936, 26, 434—438).—A wire-grating spectrometer was used to investigate the transmission of powder films of uniform particle size obtained by dispersion in a liquid, or, for particles $>67 \mu$, by sieves. Quartz powders eliminate the 40—80 μ band and form efficient filters over 6.5—7.9 μ . Filters obtained by fuming MgO or distilling Se are satisfactory over 0.5—10 μ , and NaCl and KBr powders for 10—40 μ .

N. M. B.

Infra-red absorption spectra of some polyatomic fluorides. C. R. BAILEY, J. B. HALE, and J. W. THOMPSON (J. Chem. Physics, 1937, 5, 274—275).—By combining infra-red results with Raman data it is concluded that BF_3 is planar, NF_3 is a very flat pyramid with a bond angle of $<110^\circ$, CF_4 and SiF_4 are tetrahedral. Fundamental frequencies and their activities are discussed and force consts. are evaluated.

W. R. A.

Absorption and fluorescence spectra of ions of the rare earths in solid bodies especially in the infra-red. H. GOBRECHT (Ann. Physik, 1937, [v], 28, 673—700; cf. this vol., 60).—Spectra were measured of cryst. $\text{M}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ (I) (M = rare earth atom), down to -180° in the visible and of solutions of (I) in borax beads down to 2.5 μ . Deviations from selection rules were observed in the fluorescence spectra. Screening consts. were determined for Sm , Eu , Tb , and Dy . The Stark effect of the electric field of the crystals was investigated theoretically and the symmetry of the field determined.

O. D. S.

OH vibration spectrum in the photographic infra-red. S. MIZUSHIMA, Y. UEHARA, and Y.

MORINO (Bull. Chem. Soc. Japan, 1937, 12, 132—135).— MeOH , EtOH , Pr^nOH , Bu^nOH , PhOH , *o*- and *p*- $\text{C}_6\text{H}_4\text{Cl} \cdot \text{OH}$, *o*- $\text{C}_6\text{H}_4\text{Br} \cdot \text{OH}$, and *o*-cresol in CCl_4 solution all show two maxima in the region 10,000—13,600 cm^{-1} , which are regarded as the second and third overtones of the OH vibration. The frequencies of the first overtones are thence calc., and agree with the experimental vals. of Wulf and Liddel (A., 1935, 1189). All the overtones are duplicated for the *o*- $\text{C}_6\text{H}_4\text{Hal} \cdot \text{OH}$ as required by Pauling (A., 1936, 718). The dissociation energies calc. from these results agree with thermochemical vals. F. R. G.

Near infra-red spectra of organic substances in the liquid and vapour states. A. NAHERNIAC (Ann. Physique, 1937, [xi], 7, 528—597).—Using a spectrometer of high dispersion and automatic recording, the characteristic OH band was investigated for a no. of alcohols, acids, and phenols in the liquid and vapour state and for the liquid-vapour transition. For vapours, on ascending the primary alcohol series, the band is displaced to longer $\lambda\lambda$ to a finally const. position; the displacement is progressively greater for *sec.* and *tert.* alcohols; in the case of acids it is more marked, but proceeds to shorter $\lambda\lambda$ on ascending the series. For liquids, the alcoholic OH bands are not displaced, except in the case of *tert.* alcohols and those containing a double linking. The acids, on heating, show a strongly displaced band. Data for PhOH in CCl_4 and C_6H_6 were obtained. Infra-red absorption was measured as a function of temp. to beyond the crit. point for liquid-vapour transition. For all infra-red bands and Raman lines which undergo sharp displacement the displacement curve is similar to the Mathias rectilinear diameter curve, indicating that the OH oscillation frequency depends on van der Waals forces between the mols., and that there is a direct relation between density and OH group frequency. The OH band intensity increases to the crit. point, an effect due to the dissolution of mol. associations. Results are discussed and interpreted on the basis of inter- and intra-mol. van der Waals forces.

N. M. B.

Infra-red absorption spectra of mixtures of alcohol and water. D. WILLIAMS, R. D. WEATHERFORD, and E. K. PLYLER (J. Opt. Soc. Amer., 1936, 26, 149—152).—The absorption spectra of $\text{EtOH} \cdot \text{H}_2\text{O}$ mixtures, studied in the region 1.5—5 μ , showed a band at 2.8 μ not characteristic of EtOH or H_2O . For small concns. of H_2O the intensity of this band increased with increasing H_2O content. The band is interpreted as indicating association of H_2O and EtOH mols., in agreement with anomalous vol. and sp. heat changes in the mixtures.

N. M. B.

Effects of certain liquids on the OH vibrational band of alcohol. W. GORDY (Physical Rev., 1937, [ii], 51, 564—566; cf. this vol., 112).—Transmission curves for several different concns. of MeOH in dioxan, MeCN , Pr^n_2O , C_6H_6 , and CCl_4 , and of EtOH in dioxan, for the region 2.55—3.15 μ are given. In the first three cases the OH band is shifted to shorter $\lambda\lambda$ with increase in intensity. No correlation with the electric moment of the solvent mol. was found, but a type of interaction with OH is suggested and discussed.

N. M. B.

The two infra-red OH bands of alcohols and polyalcohols; molecular association. R. FREYMAN (Compt. rend., 1937, 204, 1063—1065; cf. this vol., 131).—One band, at about $2.75\ \mu$, is strong in the vapour phase, but weak in the liquid phase at room temp.; it is intensified by raising the temp., or dilution in CCl_4 . The second band, at about $2.98\ \mu$, is given by the solid and by the liquid at low temp. The two bands are compared with those given by the supposed *cis* and *trans* forms of $\text{o-C}_6\text{H}_4\text{Cl-OH}$. Similar bands occur with Et lactate and tartrate.

A. J. E. W.

Infra-red absorption spectra and ethylenic compounds. I. General. Ethylenic alcohols. II. β -Allyl bromide homologues and ethylenic nitriles. R. DELABY and J. LECOMTE (Bull. Soc. chim., 1937, [v], 4, 738—749, 749—759).—I. Infra-red absorption spectra ($7\text{--}20\ \mu$) are recorded for 3 primary aliphatic alcohols (type, $\text{OH}\cdot\text{CH}_2\cdot\text{CH}\cdot\text{CHR}$), 12 *sec.* aliphatic alcohols (type, $\text{CH}_2\cdot\text{CH}\cdot\text{CHR}\cdot\text{OH}$), 5 *sec.* aromatic alcohols, and for cyclohexylvinylcyclohexanol.

II. Data are recorded for 12 aliphatic bromides (type, $\text{CHR}\cdot\text{CH}\cdot\text{CH}_2\text{Br}$) and for 11 aliphatic nitriles (type, $\text{CHR}\cdot\text{CH}\cdot\text{CH}_2\text{CN}$).

H. J. E.

Near infra-red absorption spectra and Raman spectra of derivatives of nitrogen. II. Amines. (MME.) M. FREYMAN and R. FREYMAN (J. Phys. Radium, 1936, [vii], 7, 476—480; cf. A., 1936, 921).—Raman spectra and near infra-red absorption spectra ($0.8\text{--}1.2\ \mu$) for aliphatic, aromatic, and heterocyclic amines have been compared. The bands are const. for an homologous series, but the primary and *sec.* aromatic amines show, with respect to the aliphatic amines, a displacement ($100\text{--}200\ \text{\AA}$.) of the first order of the NH band towards the visible, attributed to double linkings in neighbourhood of N, and $<50\ \text{\AA}$. for the second order depending on the position and electric moment of the substituents ($\sigma > m > p$). The examination of pyrrole and piperidine shows that equilibrium exists between coplanar and non-coplanar forms of the mol.

F. J. L.

Absorption measurements of organic dyes in the near infra-red. A. SCHILLER (Z. Physik, 1937, 105, 175—192).—The absorption spectrum in the red and near infra-red has been determined for 18 dyes related in structure to the type $\text{R}\cdot\text{CH}\cdot\text{CR}\cdot\text{R}'$ (R = variously substituted aromatic nuclei) and also for the two infra-red photographic sensitizers, cryptocyanine and neocyanine. Results are discussed in general terms.

H. C. G.

Raman spectra of crystalline powders. IV. Some organic and inorganic compounds. R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1937, 5, A, 200—221; cf. this vol., 10, 167).—A discussion of the spectra and structure of cryst. C_6H_8 , $\text{H}_2\text{C}_2\text{O}_4$, $\text{CO}(\text{NH}_2)_2$, guanidine hydrochloride, NH_4Ac , $\text{EtCO}\cdot\text{NH}_2$, glycine, $\text{CH}_2\text{Ph}\cdot\text{CO}_2\text{H}$, H_3PO_3 , Na_2HPO_3 , H_3PO_4 , H_3BO_3 , obtained from powders, using the author's method of complementary filters.

R. C. M.

Raman effect at low temperature: phosphorus trichloride, cyclohexane, and chlorobenzene. S. C. SIKKAR (Indian J. Physics, 1937, 11, 55—64).—

The Raman spectra of PCl_3 , C_6H_{12} , and PhCl at the temp. of liquid O_2 have been investigated. Only PhCl shows new lines in the neighbourhood of the Rayleigh line and their significance and origin are discussed. The influence of temp. on the location of the lines of the other compounds is also discussed.

W. R. A.

Constitution of acids of the elements of group V of the periodic system, and their salts. II. Acids of arsenic. F. FEHÉR and G. MORGENSTERN (Z. anorg. Chem., 1937, 232, 169—178; cf. this vol., 167).—The Raman spectra of H_3AsO_4 and its K and Na salts afford evidence of the existence of H_3AsO_4 , $\text{H}_2\text{AsO}_4'$, HASO_4'' , and AsO_4''' in solution. The anhyd. acid has the structure $\text{O}\cdot\text{As}(\text{OH})_3$. Observations with H_3AsO_3 in presence of NaOH or KOH show that H_3AsO_3 is monobasic.

E. S. H.

Effect of temperature on the Raman frequencies of topaz, beryl, and calcite crystals. T. KORCEWICZ (J. Phys. Radium, 1937, [vii], 8, 6—10).—The variation of the frequencies (ν) of the Raman lines of topaz, beryl, and calcite crystals with temp. (20° and 500°) has been investigated. In each case ν decreases with rise of temp. The natural vibrations of calcite are discussed, and their variation with temp. is considered on the basis of Kornfeld's theory. Experimental results agree satisfactorily with theory.

A. J. M.

Raman spectra of amino-acids and related substances. III. Ionisation and methylation of the amino-group. J. T. EDSALL (J. Chem. Physics, 1937, 5, 225—237).—Raman spectra of methylated amines and the corresponding hydrochlorides in aq. solution, of NEt_3 and its hydrochloride, and of the hydrochlorides of N_2H_4 , NH_2OH , and NMe_3O are recorded. Polarisation measurements have been made on some. Since the spectra of the hydrochlorides arise from the NH_4^+ ion only, spectra of these ions resemble those of analogous hydrocarbons, in which a C replaces N^+ . By treating groups, e.g., Me and NH_3^+ , as single atoms of the same mass all the compounds are represented as simple models. From the similarity to hydrocarbon spectra, and by means of the simple models and qual. polarisation data, assignment of observed frequencies to modes of mol. vibration have been made. Bond force consts. and valency angles have been evaluated for some of the compounds. For $\text{N}_2\text{H}_4\cdot 2\text{HCl}$ lines attributable to $^+\text{H}_3\text{N}\cdot\text{NH}_2^+$ and $^+\text{H}_3\text{N}\cdot\text{NH}_2$ are found. The frequencies for aq. solutions of amines are approx. the same as those for the pure anhyd. liquids. The characteristic valency vibrations of the uncharged NH_2 -group, between 3300 and $3400\ \text{cm}^{-1}$, are not found in the $^-\text{NH}_3^+$ or NH_2^+ groups. Comparison of ionised and non-ionised amines with glycine and alanine and their Na salts yields evidence that NH_2 -acids exist as dipolar ions $^+\text{H}_3\text{N}\cdot\text{R}\cdot\text{COO}^-$.

W. R. A.

Raman effect as a method of analysis of amino-acid solutions. N. WRIGHT and W. C. LEE (Nature, 1937, 139, 551—552).—Additional (cf. A., 1935, 1190) Raman frequencies for solutions of *dl*-valine (I), *l*-leucine, and *dl*-phenylalanine are recorded. Comparison of the Raman spectra of 5% aq. solutions

of glycine, *dl*-alanine, (I), and a mixture of the three, with the spectrum of a zein hydrolysate from which the less sol. NH_2 -acids had been partly removed shows that the Raman effect can be used for the analysis of solutions containing only a limited no. of NH_2 -acids.

L. S. T.

Raman spectra of some simple molecules.

R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1937, 5, A, 285—300).—The spectra of Me_2O , COCl_2 (I), $n\text{-C}_4\text{H}_{10}$ (II), $(\text{CH}_2\cdot\text{NH}_2)_2$, $(\text{CH}_2\cdot\text{OH})_2$ (III), $\text{C}_2\text{H}_4\text{Br}_2$ (IV), $\text{C}_2\text{H}_4\text{Cl}_2$ (V), $\text{C}_2\text{H}_2\text{Cl}_4$, $\text{C}_2\text{H}_2\text{Br}_4$ (VI), and C_2Cl_6 have been re-studied, and the results classified by means of polarisation data in the case of (I)—(VI). The coexistence of *cis* and *trans* compounds of the C_2H_6 derivatives is supported.

R. C. M.

Raman effect. LXIII. Five-membered ring.

II. Experiments with models. A. W. REITZ (Z. physikal. Chem., 1937, B, 35, 363—381; cf. A., 1936, 1180).—By means of mechanical models vibration frequencies have been calc. for *cyclo*-pentane, -pentene, -pentadiene, and their derivatives. The model method is of only limited val. in interpreting frequency abnormalities of five-membered rings.

R. C.

Molecular symmetry of thiophen. II. G. B.

BONINO (Atti R. Accad. Lincei, 1936, [vi], 24, 374—380; cf. this vol., 10).—Theoretical. Further possible structures for $\text{C}_4\text{H}_4\text{S}$ are discussed. Most of the Raman and infra-red data favour a C_{2v} symmetry.

O. J. W.

Raman spectrum of aromatic hydrocarbons with condensed nuclei. I. Anthracene and phenanthrene and their molecular symmetry. R. MANZONI-ANSIDEI (Atti R. Accad. Lincei, 1936, [vi], 24, 368—373).—A more detailed account of work already noted (cf. this vol., 10).

O. J. W.

Polymerisation of styrene as revealed by the

Raman effect. S. MIZUSHIMA, Y. MORINO, and Y. INOUE (Bull. Chem. Soc. Japan, 1937, 12, 136—137).—Contrary to Signer and Weiler (A., 1932, 559) in polystyrene (mol. wt. 1150 in C_6H_6) the line due to the ethylenic linking does not disappear, but is reduced in intensity inversely as the mol. wt., in accordance with the structure of Staudinger and Steinhöfer (A., 1935, 740). The η of $\text{CHPh}\cdot\text{CH}_2$ changes before the reduction in intensity is appreciable. The early stages of polymerisation are attributed to micelle formation arising from van der Waals forces.

F. R. G.

New type of diffusion spectrum of crystals and structure of liquids. E. GROSS and M. VUKS (J. Phys. Radium, 1936, [vii], 7, 113—117; cf. A., 1935, 281).—Lines with $\Delta\nu$ between 20 cm^{-1} and 130 cm^{-1} are observed in the Raman spectra of single crystals of C_6H_6 , Ph_2O , C_{10}H_8 , and *p*- $\text{C}_6\text{H}_4\text{Br}_2$. They coincide with the continuous diffused region in the spectra of the liquids, in agreement with the authors' theory of the origin of this diffusion.

O. D. S.

Fluorescence of rhodamine. G. R. FONDA (J. Opt. Soc. Amer., 1936, 26, 316—322).—The efficiency of light conversion and resistance to fading of fluorescence under visible light was investigated for

x (A., i.)

solid films. The solvent and concn. for : max. efficiency are cellulose acetate, 30% solution in COMe_2 containing 0.2 g. of rhodamine per litre. The optimum film thickness is 0.014 cm. Resonance losses account for the abrupt efficiency decrease at higher concns. Fading of fluorescence under exposure to visible Hg light is due to a destruction of rhodamine by bleaching, and its speed varies with thickness as does the efficiency. Resistance to fading is increased by substituting an org. radical or a metal for the H in the CO_2H group.

N. M. B.

Brownian movement of an ellipsoid. Free rotation and depolarisation of fluorescence. Translation and diffusion of ellipsoidal molecules. F. PERRIN (J. Phys. Radium, 1936, [vii], 7, 1—11).—Mathematical (see A., 1935, 15).

F. J. L.

Effects of electric field on phosphorescent sulphides. G. DESTRIAU (J. Chim. phys., 1937, 34, 117—124; cf. A., 1936, 1320).—The luminescence of phosphorescent ZnS can be excited by application of a varying electric field, the phosphorescence bands being deformed and shifted towards shorter λ compared with those of the normal phosphorescence. Alternating fields may either intensify the transient luminescence of a sulphide previously excited by light or weaken it.

R. C.

Quantum interpretation of the mirror symmetry of absorption and luminescence spectra. V. L. LEVSOHN (Acta Physicochim. U.R.S.S., 1937, 6, 213—228).—Theoretical.

J. W. S.

Potential and luminescence of insulated willemite cathode-ray screens. W. B. NOTTINGHAM (Physical Rev., 1937, [ii], 51, 591).—Results of experiments on two phosphors are reported.

N. M. B.

Electric breakdown field intensity of water and aqueous solutions. Y. TORIYAMA and U. SHINOHARA (Physical Rev., 1937, [ii], 51, 680).—Breakdown voltage curves are given for distilled H_2O , and for aq. solutions of BaCl_2 , NaCl , NaOH , HCl , and NH_3 . Results indicate that there is no direct relation between the current-voltage characteristic and the breakdown field intensity of liquid dielectrics, and that breakdown is an electronic, and conduction through liquid dielectrics an ionic, phenomenon.

N. M. B.

Volume rectification effect in illuminated crystals of cuprous oxide. G. GROETZINGER and J. LICHTSCHEIN (Physical Z., 1937, 38, 292—298).—Natural Cu_2O crystals which show the crystal photo-effect (Dember effect) show also, on illumination, a rectifying effect. The two effects are intimately connected. The effect of variation of intensity, direction, and spectral range of the incident light was studied. In blue light, for which the crystal photo-effect has an opposite sign from that in white light, the rectifying effect is also reversed in direction. Artificial Cu_2O crystals, which do not show the crystal photo-effect, do not give the rectifying effect.

A. J. M.

Investigation of barrier-type photo-cells with soft X-rays. H. FELSINGER (Ann. Physik, 1937,

[v], 29, 81—96).—The response of barrier type photo-cells of Cu_2O and of Se to soft X-rays (5 to 25 kv.) was investigated. Dependence of photo-current and voltage of each cell on the anti-cathode current and tube voltage was measured. The current output of the front wall cell was about the same order as for visible light. A. E. M.

Amorphous state. IX. Electrical conductivity and viscosity of alcohols. P. P. KOBEKO, E. V. KUVSHINSKI, F. A. GORODEZKAJA, I. P. BAGHAEV, and S. G. SHITNIKOV. X. Conductivity of strong electrolytes in the amorphous state. P. P. KOBEKO, E. V. KUVSHINSKI, and N. J. SCHISCHKIN (Acta Physicochim. U.R.S.S., 1937, 6, 239—254, 255—262).—IX. For simple alcohols, glycerol, and solutions of HCl in $\text{C}_5\text{H}_{11}\text{OH}$, $\log \rho$ and $\log \eta$ (ρ = sp. resistance, η = viscosity) are not linear functions of $1/T$ over the amorphous and softening regions; but $\log \rho$ is a linear function of $\log \eta$ and Walden's law holds over wide temp. intervals. The variation of $1/\rho$ with temp. is probably due to change of mobility and not to dissociation. Over the same temp. interval the dielectric const. (ϵ) rises slowly and then, beyond a certain temp., rapidly with rise of temp., finally falling with rise of temp. in the liquid state.

X. ρ and ϵ have been determined for H_2SO_4 , $\text{H}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$, H_3PO_4 , and 25% aq. KOH, and η for H_2SO_4 over the amorphous and softening regions. $\log \rho$ is not a linear function of $1/T$, but is a linear function of $\log \eta$. Discontinuities occur in the $\log \rho = f(1/T)$ curve, the portion below the discontinuity (i.e., for the amorphous state) being coincident with and an extension of the curve for the cryst. state. This can be explained on modern theory of the state of glasses (A., 1933, 12). J. W. S.

Unipolar electrical conductivity of carborundum. M. K. CHAKRAVARTY and S. R. KHASTGIR (Z. Physik, 1937, 105, 88—91).—Steady potentials are applied to crystals of carborundum, Fe pyrites, galena, and magnetite soldered into brass cups, by means of a Ag needle. Potentials measured between this needle and a movable needle are plotted against distance between them, and by reversal of the steady potential it is shown that carborundum possesses unidirectional conductivity; pyrites, galena, and magnetite do not. L. G. G.

Dielectric constant of an electronic atmosphere for ultra-short waves. A. IMAN and S. R. KHASTGIR (Indian J. Physics, 1937, 11, 37—48).—The dielectric const. of an electronic medium measured between the plate and the filament of a dull-emitting screen-grid valve first decrease and subsequently increase with increasing vals. of the thermionic current, and decrease with λ for the shorter λ . W. R. A.

High dielectric constants. F. C. FRANK (Trans. Faraday Soc., 1937, 33, 513—523).—The influence of chemical constitution on dielectric properties is discussed, particularly with reference to the part contributed by electronic polarisation. The chief criterion of high dielectric const. (D) in substances of ionic character is a high val. of the ratio (ionic

refraction)/(ionic vol.). The influence of cryst. structure in promoting a high D is dependent on (1) close packing and (2) directional effects due to lattice vibrations. The temp. coeff. of D , and the correlation between high D and electronic semi-conduction, are also discussed. F. L. U.

Dipole moments of phosphorus pentafluoride and boron trifluoride, and vapour pressure curve of phosphorus pentafluoride. R. LINKE and W. ROHRMANN (Z. physikal. Chem., 1937, B, 35, 256—260).—Dielectric const. measurements over a wide temp. range show the dipole moments to be zero. The sublimation pressure and v.p. of PF_5 at 147.5—188.6° abs. rises from 6.4 to 755.0 mm. R. C.

Dielectric polarisation of n -long-chain ketones near their m.p. A. MÜLLER (Proc. Roy. Soc., 1937, A, 158, 403—414).—The dielectric const. of a paraffin, $\text{C}_{22}\text{H}_{46}$, and two ketones, $\text{C}_{17}\text{H}_{34}\text{O}$ and $\text{C}_{23}\text{H}_{46}\text{O}$, are measured near their m.p. The paraffin shows a small decrease (2%) in dielectric const. on melting; the ketones show a large increase which starts some 15° < m.p. The results are interpreted as being due to an increase in the rotational mobility of the mols. around the chain axes in the solid state. Dipole moments calc. for the pure molten substance and from their dil. solutions indicate interaction between dipoles. G. D. P.

Dielectric constants of solids at high frequencies and the influence of water of crystallisation on dielectric constant. E. F. BURTON and L. G. TURNBULL (Proc. Roy. Soc., 1937, A, 158, 182—198).—The dielectric const. of MgSO_4 , CuSO_4 , borax (cryst. and dehydrated), and of NaCl, K alum, and KI, are measured at room temp. and a frequency of 2×10^6 cycles per sec. The dehydration of a salt increases its dielectric const. The change in mol. refractivity per mol. of H_2O of crystallisation is approx. const. G. D. P.

Dipole moment of chlorobenzene and the effect of solvents on it, using thirty-four different liquids. F. H. MÜLLER (Physikal. Z., 1937, 38, 283—292).—The dipole moment (P) of PhCl in 34 liquids of which the dielectric const. (ϵ) varied between 1 and 4.25 was determined, in order to discover whether the variation of P with the solvent was influenced only by the ϵ of the latter. It was found that ϵ was the most important parameter, although the structure of the solvent mols. exerts a smaller effect. P of PhCl in a series of aliphatic hydrocarbons decreases more rapidly than is accounted for by the change in ϵ as the chain is increased in length. This is due to the fact that the longer is the chain the more incompletely is the PhCl mol. surrounded by the solvent mol. Comparison with the Debye theory of rotation coupling shows that $\epsilon - 1 \propto E$ (E = rotation coupling energy). Deviations in mixed solvents are discussed. A. J. M.

Dipole moments of the chalcones and β -ethoxychalcones. F. EISENLOHR and A. METZNER (Z. physikal. Chem., 1937, 178, 350—354).—In C_6H_6 the forms of chalcone of m.p. 49°, 57°, and 59° have the same dipole moment, and the same is true of the four forms of β -ethoxychalcone. R. C.

Molecular interactions and the structure of liquids. P. GIRARD and P. ABADIE (J. Phys. Radium, 1936, [vii], 7, 211—214; cf. A., 1936, 666).—A discussion of the interpretation of the max. in the curves obtained by plotting time of relaxation of dipoles against concn. of a polar solute in a non-polar solvent. For concns. near the max. a quasi-cryst. state exists. H. J. E.

Structure of dipole liquids. J. MALSCH (Ann. Physik, 1937, [v], 29, 48—60).—A theoretical survey of mol. polarisation, dielectric saturation, anomalous dispersion and absorption in relation to pure polar liquids. L. G. G.

Dielectric constant and dipole loss of glasses at high frequencies. W. HACKEL (Ann. Physik, 1937, [v], 29, 63—80).—A resonance method is described for the simultaneous measurement of ϵ and κ of plates of glass over a λ range 12,000—10 m., by immersion in H₂O-dioxan mixtures adjusted to have ϵ and κ equiv. to the glass under examination. The method is independent of the shape of the solid dielectric. L. G. G.

Anomalous dispersion of excited argon. K. SCHÖN (Ann. Physik, 1937, [v], 28, 649—666).—The anomalous dispersion of electrically excited A in the neighbourhood of the $1s_1-2p_k$ lines has been measured. Results are analogous to those obtained by Ladenburg for Ne (A., 1934, 575). O. D. S.

Optical constants of potassium. H. E. IVES and H. B. BRIGGS (J. Opt. Soc. Amer., 1936, 26, 238—246).—Using the Babinet compensator with the addition of right and left rotary quartz wedges forming a plane parallel plate between the compensator and analyser, vals. of n and extinction coeffs. were obtained for the range 5780—2536 Å. N. M. B.

Photo-electric emission from thin films of potassium. H. E. IVES and H. B. BRIGGS (J. Opt. Soc. Amer., 1936, 26, 247—250).—Results previously obtained (cf. preceding abstract) are applied to the photo-electric theory and results are compared with experiment. Satisfactory agreement on the short- λ side of the curves, but not on the long- λ side, is found. The behaviour of bulk K is discussed. N. M. B.

Refraction and dispersion of heavy methane (CD₄). T. LARSEN (Z. Physik, 1937, 105, 164—167).—Measurements were made with a Jamin refractometer between λ 5680 and 2300 Å. Compared with CH₄, CD₄ shows a decrease in the refractivity and a general flattening of the dispersion curve analogous to that found in the cases of D₂ and D₂O vapour. H. C. G.

Optical properties and polymorphism of paraffins. C. D. WEST (J. Amer. Chem. Soc., 1937, 59, 742—743).—Procedure for determining n of substances that solidify to form transparent uniaxial films is described. The dimorphism of solid Ac₂ is demonstrated and approx. vals. of its optical consts. have been determined for the solid and liquid phases between 20° and 80°. E. S. H.

Spectrochemistry of unsaturated compounds. K. VON AUWERS and R. HÜGEL (Z. physikal. Chem.,

1937, 178, 315—321).—Measurements of n with glycol and glycerol esters of saturated and unsaturated acids have shown that in general the optical exaltation of a compound with several isolated conjugated groups of linkings \propto the no. of such groups.

R. C.
Spectrochemistry of pyridine and pyridone derivatives. K. VON AUWERS (Z. physikal. Chem., 1937, 178, 322).—Corrections and additions to a previous paper (A., 1933, 556). R. C.

Optical properties of some halogenated derivatives of camphor. J. P. MATHIEU and J. PERRICHET (J. Phys. Radium, 1936, [vii], 7, 138—140).—The absorption, rotation, and circular dichroism between 650 and 250 m μ of α -chloro-, α -bromo-, $\alpha\alpha$ -dichloro-, and $\alpha\alpha$ -dibromo-camphor have been measured. An absorption band about 300 m μ shows a strong Cotton effect, but the max. of dichroism is displaced towards longer $\lambda\lambda$ relative to the absorption max. O. D. S.

Optical rotation and atomic dimensions for the four optically active α -halogeno- β -methylbutanes. D. H. BRAUNS (J. Res. Nat. Bur. Stand., 1937, 18, 315—331).—The prep. and vals. of $[\alpha]$, d , b.p., and n are given for the optically active α -fluoro-, -chloro-, -bromo-, and -iodo-derivatives of β -methylbutane and for β -methylbutanol. The differences in the mol. rotations of the halogen derivatives, Cl—F, Br—Cl, and I—Br, are in the ratio 41:18.1:21.6 for λ 5892.5 Å. and 41:18.5:21.6 for 5461 Å., which are close to the ratio of the differences in at. radii of the halogens, viz., 41:16:21, as in the case in which the halogen is directly attached to the asymmetric C (cf. A., 1931, 1355). R. S. B.

Constitution, optical activity, and photochemical behaviour of platino-complexes. II. I. LIFSCHITZ and W. FROENTJES (Z. anorg. Chem., 1937, 232, 161—168; cf. A., 1935, 1335).—A consideration of Jensen's results (A., 1936, 12), and a reply. E. S. H.

Structure of N₂⁺ and its bearing on the theory of valency. R. K. ASUNDI and R. SAMUEL (Proc. Indian Acad. Sci., 1937, 5, A, 244—248; cf. A., 1936, 477).—Theoretical. From its excitation energy, N₂⁺ must possess a double linking, disturbed by the odd electron, giving another example in favour of the pair-bond theory of valency. The spectroscopic CN mol., having the same no. of electrons, must also have a double linking. Other cases of disturbance caused by odd electrons are discussed. R. C. M.

Synchronised oscillations in hydrogen bridges. M. L. HUGGINS (Nature, 1937, 139, 550).—The tendency of the electron distribution around the ring containing the H bridge to shift in synchronism with the oscillation of the bridge H is as important as resonance as a stabilising factor. In rings containing two H bridges the two bridging H tend to oscillate synchronously, the oscillation of each helping that of the other. Synchronous oscillation of the H of H bridges suitably linked together in long strings increases stability. In proteins, some of the chief

forces connecting the primary chains are considered due to H bridges.

L. S. T.

Potential constants of tetrachloroethylene. J. DUCHESNE (Nature, 1937, 139, 634).—A correction (cf. this vol., 224).

L. S. T.

Electronic structure of some polyenes and aromatic molecules. I. Nature of links by the method of molecular orbitals. J. E. LENNARD-JONES. II. Nature of the links of some aromatic molecules. J. E. LENNARD-JONES and J. TURKEVICH. III. Bonds of fractional order by the pair method. W. G. PENNEY (Proc. Roy. Soc., 1937, A, 158, 280—296, 297—305, 306—324).—I. Formulæ are given for the lengths of links in conjugated hydrocarbon chains. In short chains there are two kinds of link. In long chains both links tend to equal 1.38 Å.

II. Formulæ are derived for the lengths of links of cyclic aromatic mols. C_6H_6 is shown to be a regular hexagon of side 1.37 Å. Other cyclic mols. are irregular and consist of alternate long and short links. The method is also applied to Ph_2 and $C_{10}H_8$.

III. The electron pair theory of "resonance" is interpreted by ascribing fractional orders to linkings. A method of evaluating the bond order is suggested, and hence bond energies are found. Heats of formation may then be calc. The ionic diameter of C atoms is correlated with bond order in cases where internuclear distance is known. Hence by calculating the bond order the internuclear distances of butadiene, hexatriene, octatetraene, $C_{10}H_8$, and the infinite chain are predicted.

G. D. P.

"Free" and "non-free," "loose" and "bound" valency electrons of carbon in organic substances. O. SCHMIDT (Z. Elektrochem., 1937, 43, 238—246).—Theoretical. The significance of free and bound electrons is discussed, with special reference to org. decomp. reactions.

E. S. H.

Molecular orbitals. A. F. DEVONSHIRE (Proc. Camb. Phil. Soc., 1937, 33, 250—252).—Mathematical. A method of obtaining an approx. solution of Schrödinger's equation with a non-central field of force is given, when a solution of a similar equation involving angular co-ordinates only is known.

A. J. M.

Symmetry properties of the forces in atomic nuclei and results for the states, particularly for nuclei up to sixteen particles. F. HUND (Z. Physik, 1937, 105, 202—228).—Theoretical.

L. G. G.

Exchange energy in many-electron problems. L. GOLDSTEIN (J. Phys. Radium, 1936, [vii], 7, 141—145).—Mathematical.

O. D. S.

Interaction of atoms and molecules with solid surfaces. VI. Behaviour of adsorbed helium at low temperatures. VII. Diffraction of atoms by a surface. J. E. LENNARD-JONES and A. F. DEVONSHIRE. VIII. Exchange of energy between a gas and a solid. A. F. DEVONSHIRE (Proc. Roy. Soc., 1937, A, 158, 242—252, 253—268, 269—279).—VI. The lateral velocity of migration of He atoms on the surface of a LiF crystal is calc. Even at the lowest temp. the periodic field of the surface does not prevent migration.

VII. The theory of diffraction of atoms at a surface is given.

VIII. An expression for the accommodation coeff. of a monat. gas on a solid is obtained. Applied to the cases of He and Ne on W, satisfactory agreement with experiment is shown.

G. D. P.

Ionisation, excitation, and chemical reaction in uniform electric fields. III. Excitation of the continuous spectrum of hydrogen. R. W. LUNT, C. A. MEEK, and E. C. W. SMITH (Proc. Roy. Soc., 1937, A, 158, 729—738).—Experiments were made to determine the energy efficiency of excitation of the continuous spectrum of H as a function of Xp^{-1} , the ratio of electric field to pressure. In the range of Xp^{-1} between 25 and 140 satisfactory agreement with theory is obtained. For higher vals. of Xp^{-1} the theory gives too small a val. for the energy.

G. D. P.

Exact and approximate expressions for the permeability of potential barriers to light particles. R. P. BELL (Proc. Roy. Soc., 1937, A, 158, 128—136).—The validity of approx. expressions for the permeability of potential barriers is discussed. A solution of the wave equation is obtained for a parabolic barrier; when the energy of the particles is equal the max. potential energy of the barrier a solution can be obtained for a more general type of barrier. This solution is used to estimate the error involved in the approx. treatment. For barriers appropriate to chemical reactions the approx. expressions may be used for calculations of rates and will give accurate results for the relative rates of similar reactions.

G. D. P.

Quantum-mechanical discussion of cohesive forces and thermal expansion coefficients of the alkali metals. H. FRÖHLICH (Proc. Roy. Soc., 1937, A, 158, 97—110).—A theoretical treatment which enables the lattice const., heat of sublimation, compressibility, and thermal expansion coeff. to be calc. in terms of the ionisation potential. Satisfactory agreement with experimental vals. is obtained.

Modern theory of solids. II. F. SEITZ and R. P. JOHNSON (J. Appl. Physics, 1937, 8, 186—199).—The application of wave mechanics to differentiating between five solid types, viz., pure metals, semi-conductors, and mol., ionic, and valency crystals, and to interpreting their physical properties, is discussed.

C. R. H.

Mean electrical density of a complex atom. G. ALLARD (Compt. rend., 1937, 204, 1057—1058).—Mathematical. A development of Slater and Pauling's theory of directed valencies.

A. J. E. W.

U-effect of Amagat and Weiss. V. JACZYNA (Z. Physik, 1937, 105, 267—268).—Completion of work already noted (A., 1936, 1454).

L. G. G.

Penetration of nickel ions into rock-salt. I. A. PARFANOVITSCH and S. A. SCHIPIZIN (Acta Physicochim. U.R.S.S., 1937, 6, 263—274).—Ni can penetrate rock-salt both by electrolysis and by diffusion, the extent of penetration being shown by introducing Na into a small cavity in the face of the crystal which has been in contact with the Ni, covering

with a rock-salt plate, and heating between two electrodes, when the electron cloud produces a brownish-yellow colour in the region penetrated by the Ni. The mobility of Ni^{++} ions in NaCl at various temp. was measured. It is concluded that the U -electrons in rock-salt can combine with the Ni^{++} ions which have entered the lattice. J. W. S.

Surface tension of intensively dried α -sulphur trioxide. A. N. CAMPBELL and N. O. SMITH (Trans. Faraday Soc., 1937, **33**, 545—551).—The d and surface tension of successive fractions obtained from SO_3 intensively dried by passage of the vapour through P_2O_5 have been determined at 20° and 50° . The vals. at 20° vary irregularly but are nearly const. at 50° . It is assumed that the drying retards the attainment of equilibrium between the constituents at 20° but not at 50° . The m.p. range of the solid is large and indicates great heterogeneity.

F. L. U.

Application of convergent beam and oscillation photographs to layer lattice diagrams. O. KRATKY and G. KREBS (Z. Krist., 1937, **95**, 253—265).—The use of such methods is discussed in relation to exposure time, effects of maladjustment of the crystal, and interpretation of the photographs.

B. W. R.

Influence of perpendicular and horizontal strains on the magnitude of X-ray deformations. M. P. SHELDON and G. V. KURDJUMOV (Zavod. Lab., 1936, **5**, 752—754).—Perpendicular as well as horizontal residual strains influence the X-ray deformation diagrams.

R. T.

Scattering of X-rays at very small angles. H. H. PENLEY and J. A. GRAY (Canad. J. Res., 1937, **15**, A, 45—47).—The scattering of X-rays at very small angles has been studied with charcoal, anthracene pptd. by H_2O from solution in EtOH, and graphite. The scattering curves fall into distinct types characteristic of the charcoals on the one hand and of graphite and anthracene on the other. The Debye theory gives 20 Å. as the diameter of the smallest particle in blood charcoal. With Shawinigan charcoal the scattering at small angles is greatly reduced by pressures of 1 ton per sq. in., but for angles $>4'$ there is no change.

R. S. B.

X-Ray investigation of the glassy state. N. VALENKOV and E. PORAI-KOSCHITZ (Z. Krist., 1936, **95**, 195—229; cf. A., 1936, 413).—The two theories of the glassy state are discussed in detail—that of a continuous non-cryst. at. or ionic network (i), and that of the existence of pseudo-regular crystallites (ii). Devitrification, by (i), will be essentially a discontinuous process; by (ii) it will be the steady growth of crystallites. Also (i) gives no higher-order diffraction maxima (since there is only radial, not azimuthal, regularity) whilst (ii) gives such maxima. X-Ray photographs of various glasses and SiO_2 are discussed and agree with (ii), not (i). Ostwald's rule, solubility, and electrical conductivity are discussed.

B. W. P.

Recent crystallography. (SIR) W. BRAGG (Proc. Roy. Inst., 1937, **29**, 484—495).—A lecture.

Making crystal lattice and unit cell models.

A. SCATTERGOOD (J. Chem. Educ., 1937, **14**, 140).

L. S. T.

Distribution and geometry of twinning phenomena. H. TERTSCH (Z. Krist., 1937, **94**, 461—490).—Classification of, and comments on, the occurrence of twinning, from the mineralogical point of view.

B. W. R.

Growth of crystals at the expense of the grains close to them. J. M. ANSCHELES (Z. Krist., 1936, **95**, 150—156).—The Federov hypothesis of crystal growth is discussed. Surface tension is probably of importance.

B. W. R.

Common orientation and a classification for crystals based on a marcasite-like packing. M. J. BUEGER (Amer. Min., 1937, **22**, 48—56).—A discussion and a co-ordination of data.

L. S. T.

Nature of snow. G. SELIGMAN (Proc. Roy. Inst., 1937, **29**, 463—483).—A lecture.

Structure and morphological characteristics of ice crystals. M. P. GOLOVKOV (J. Gen. Chem. Russ., 1937, **7**, 335—340).—Ice crystals are probably of the trigonal-pyramidal type of symmetry, and of hexagonal syngony.

R. T.

Determination of lattice constants of diamond and graphite. W. TRZEBIATOWSKI (Rocz. Chem., 1937, **17**, 73—82).—For diamond at 20° a is $3.5595 \pm 0.0000_9$ Å.; at 150 — 460° $a = 3.5593_9(1 + 1.7 \times 10^{-6}t + 1.9 \times 10^{-9}t^2)$. For graphite $a = 2.456_2$, $c = 6.695_6$ Å., at 20° .

R. T.

Determination of orientation of crystals of metals. J. CZOCHRAJSKI and J. SKOWRONSKA (Przemysł Chem., 1937, **21**, 65—71).—Methods of determining crystal structure, depending on determination of planes of cleavage, and on examining the figures produced by etching spheres cut out of single crystals, are described.

R. T.

X-Ray study of the structure of copper, lead, cadmium, and antimony at high temperatures. J. E. DORN and G. GLOCKLER (J. Physical Chem., 1937, **41**, 499—506).—No evidence was obtained of the existence of transitions or of metastable forms in the temp. range studied. The metals have the following lattice structures: Cu, 20 — 420° , and Pb, 20 — 185° , face-centred cubic; Cd, 20 — 120° , hexagonal; Sb, 20 — 170° , rhombohedral.

C. R. H.

Structure of electrodeposited nickel. G. I. FINCH and A. L. WILLIAMS (Trans. Faraday Soc., 1937, **33**, 564—569; cf. A., 1936, 784).—Photomicrographs of Ni electrodeposited on a macrocryst. substrate of Cu or Cu_2O preserve throughout the essential features of the substrate, irrespective of the deposit depth, whereas the corresponding electron diffraction patterns undergo a radical change with increasing thickness of the Ni deposit. Conclusions based on microscopic methods should therefore be treated with reserve unless confirmed by electron diffraction. The influence of the substrate on the crystal size and orientation of the deposit becomes progressively weaker as the thickness of the latter increases, and is generally extinguished at depths 3×10^{-4} cm., the size being then determined by the deposition con-

ditions. Interrupting the deposition process sometimes leads to an abrupt suppression of the substrate influence in subsequently deposited layers, and to weakened adhesion of the latter. F. L. U.

Primary oxide film on iron. H. R. NELSON (J. Chem. Physics, 1937, 5, 252—259).—Electron diffraction patterns of air-formed oxide films below 200° on Fe show this film to be Fe_3O_4 and to be oriented in a definite manner to the underlying Fe (cf. this vol., 130). The high-temp. form is Fe_2O_3 . W. R. A.

Oxide films on iron. R. F. MEHL and E. L. McCANDLESS (Amer. Inst. Met. Eng. Tech. Publ. No. 780, 1937, 23 pp.; cf. A., 1936, 786).—The orientation relationships obtaining between α -iron and the phase FeO, and between Fe_3O_4 and FeO formed on it by direct reduction, provide a simple at-crystallographic picture of the mechanism of oxidation. The orientation relationships obtaining between FeO and Fe_3O_4 formed on it by eutectoid decomp. are identical with those obtaining in oxidation layers; this may prove to be a general rule. No valid method exists for the determination of the true thickness of films on Fe in the temper-colour range. The rates of temper-film formation were determined at several temp. on a large no. of single crystals of H_2 -purified Fe. A prep. of surfaces is described which gives reproducible temper colours on oxidation. R. B. C.

Crystal structure of the low-temperature modification of thallos iodide. L. HELMHOLTZ (Z. Krist., 1936, 95, 129—137).—The yellow modification (below 175°) has an orthorhombic cell, space-group D_{2h} (17), with a_0 5.24, b_0 4.57, c_0 12.92 Å. At. parameters are determined and interat. distances given. The structure is in a sense a layer type. B. W. R.

Crystal structure of $\text{Mg}_2\text{Zn}_{11}$ and its isomorphy with $\text{Mg}_3\text{Cu}_7\text{Al}_{10}$. F. LAYES and S. WERNER (Z. Krist., 1936, 95, 114—128).— $\text{Mg}_2\text{Zn}_{11}$ (to which hitherto the formula MgZn has been ascribed) is cubic with Laue symmetry O_h and a_0 8.53 Å., 6 Mg and 33 (perhaps 32) Zn in the cell. $\text{Mg}_3\text{Cu}_7\text{Al}_{10}$ has the same structure with a_0 8.29 Å., being an example of a ternary compound in a binary structure type. B. W. R.

Crystal structure of gallium nitride. J. V. LIRMANN and H. S. SCHDANOV (Acta Physicochim. U.R.S.S., 1937, 5, 306).— GaN (prepared as a friable grey powder by heating Ga in NH_3 at 1200°) has hexagonal structure of the wurtzite type, with a 3.160 ± 0.008, c 5.125 ± 0.010 Å.; cl/a — 1.622. J. W. S.

Crystal structure of $(\text{NH}_4)_2\text{SbBr}_6$, Rb_2SbBr_6 , and Rb_2SbCl_6 . K. A. JENSEN (Z. anorg. Chem., 1937, 232, 193—201).—Lattice const. and crystallographic data have been determined by X-ray analysis. The valency no. of Sb in these compounds is even, but does not appear to be 4, since $(\text{NH}_4)_2\text{SbBr}_6$ and Rb_2SbBr_6 are diamagnetic. E. S. H.

Structure of polysulphides. I. Barium trisulphide. W. S. MILLER and A. J. KING (Z. Krist., 1937, 94, 439—446).—The cell is orthorhombic, space-group $P2_1 2_1 2_1$, a_0 8.32, b_0 9.64, c_0 4.82 Å. The S_3 ion has the three atoms distributed approx. at an

angle of 103° to each other, the S—S distance being 2.15 Å. B. W. R.

Crystal structure of sodium carbonate monohydrate, $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$. J. P. HARPER (Z. Krist., 1937, 95, 266—273).—The cell is orthorhombic, 4 mols. to cell, space-group $2e-5$, a_0 10.721 Å., b_0 6.440, c_0 5.243 Å. Probable at. parameters are determined. B. W. R.

Crystal structure of potassium nitrite, KNO_2 . G. E. ZIEGLER (Z. Krist., 1937, 94, 491—499).—The cell is monoclinic, a_0 4.45, b_0 4.99, c_0 7.31 Å., β 114° 50', space-group C_2^2 . The parameter vals. are determined, the structure being a distorted NaNO_2 type. A high birefringence of the crystal is deduced. B. W. R.

Symmetry and crystal structure of manganite, $\text{Mn}(\text{OH})\text{O}$. M. J. BUEGER (Z. Krist., 1936, 95, 163—174).—An arsenopyrite-like structure is confirmed. The cell is monoclinic, space-group $B2_1/d$, a_0 8.86, b_0 5.24, c_0 5.70 Å., β 90°. $\text{Mn}(\text{OH})\text{O}$ corresponds with FeAsS , the (OH) being slightly larger than the O atom. The structure is in detail a layer structure, and accounts for the (010) cleavage. B. W. R.

Structure of pentacalcium trialuminate. W. BUSSEM and A. EITEL (Z. Krist., 1936, 95, 175—188).—By fusing together pure CaO and Al_2O_3 in proportions 5 : 3 a pure cryst. compound is obtained, d 2.69, space-group probably T_2^2 , a_0 11.95 Å., which is probably $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$ with 2 mols. in the cell. Two extra O are distributed statistically. B. W. R.

Lead titanate : crystal structure, temperature of formation, and specific gravity data. S. S. COLE and H. ESPENSCHIED (J. Physical Chem., 1937, 41, 445—451).—X-Ray data reveal the formation of only one compound in the solid state, PbTiO_3 , d 7.52, on calcining $\text{PbO}-\text{TiO}_2$ mixtures containing 25—89% PbO . Compound formation begins at 360° and is complete at 375°. PbTiO_3 crystallises as orthorhombic holohedral pyramids with a 4.000, b 4.211, c 3.875 Å., axial ratios 0.95 : 1 : 0.92. The space-group D_{2h}^1 is assigned and the most probable at. arrangement is Pb : 000; Ti : $\frac{1}{2}\frac{1}{2}\frac{1}{2}$; O : $\frac{1}{4}$ 0; $\frac{1}{4}$ $\frac{1}{2}$; $0\frac{1}{4}$. C. R. H.

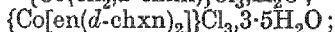
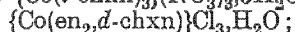
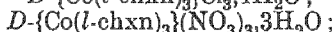
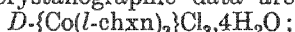
Formula of ammonium paramolybdate. J. H. STURDIVANT (J. Amer. Chem. Soc., 1937, 59, 630—631).—The formula $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$ is confirmed by determination of lattice const., space-groups, and d . E. S. H.

Crystallography and chemistry of the lower hydrates of heteropoly-acids. O. KRAUS (Naturwiss., 1937, 25, 250—251).—Hydrates of $\text{H}_3\text{SiW}_{12}\text{O}_{40}$, $\text{H}_3\text{PW}_{12}\text{O}_{40}$, $\text{H}_5\text{BW}_{12}\text{O}_{40}$, $\text{H}_3\text{PMo}_{12}\text{O}_{40}$, and $\text{H}_4\text{SiMo}_{12}\text{O}_{40}$ containing 14 H_2O are triclinic and isomorphous. The lattice is face-centred, and the space-group is C_i , with 8 mols. in the unit cell. The complex anions of the type $[\text{SiW}_{12}\text{O}_{40}]^{7-}$ are arranged like the C atoms in a slightly distorted diamond lattice. The previously described (Rosenheim *et al.*, A., 1918, ii, 77) $\text{B}_2\text{O}_3 \cdot 24\text{WO}_3 \cdot 29\text{H}_2\text{O}$ has been shown to be a mixture of $\text{H}_5\text{BW}_{12}\text{O}_{40} \cdot 14\text{H}_2\text{O}$ and $\text{H}_5\text{BW}_{12}\text{O}_{40} \cdot 5\text{H}_2\text{O}$. The latter is obtained from solution as strongly refracting rhombododecahedral crystals. The

previously described $P_2O_5 \cdot 12WO_3 \cdot 42H_2O$ is identical with $H_3PW_{12}O_{40} \cdot 14H_2O$ (cf. Jander *et al.*, A., 1936, 1477). The crystal form of hydrates of the above acids containing 21, 24, 29 and $30H_2O$ is also given.

A. J. M.

Complex salts of the racemic and optically active *cyclohexanediamines* with tervalent cobalt and rhodium. IV. Crystallographic properties of optically active *tricyclohexanediamine* cobaltic salts and *ethylenediamine cyclohexanediamine* cobaltic salts of the series. F. M. JAEGER and L. BIJKERK (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 316—325; cf. this vol., 259).—Crystallographic data are recorded for



$\{Co(r\text{-}chxn)_2\}I_3 \cdot H_2O$ ($chxn = cyclohexanediamine$). Salts of the type $\{Co(X_2Y)\}Cl_3$ are shown to be unstable in general, decomp. into $\{CoX_2\}Cl_3$ and $\{CoY_3\}Cl_3$.

F. J. L.

Systematic method of investigating superstructures, applied to the arsenopyrite crystal structure type. M. J. BUEGER (Z. Krist., 1936, 94, 425—438).—Where formal theory gives no structure solution, it may be possible to obtain a structure using the plane group theory and simple X-ray deductions. The method is developed for the arsenopyrite structure type.

B. W. R.

Fibrous brucite. J. GARRIDO (Z. Krist., 1937, 95, 189—194).—The cell structure is the same as that of the normal mineral. The orientation of the small crystals in the fibre is studied from Weissenberg photographs. On dehydration at 500° the resultant cubic MgO crystals preserve a certain orientation in relation to the original texture.

B. W. R.

Crystal structures of alkyl-metal complexes. A. F. WELLS (Z. Krist., 1937, 94, 447—460).—Using intensity measurements and a simple Fourier analysis, the structure of solid $AsEt_3 \cdot CuI$ is found in detail, and compared with that of the analogous compounds $PBu_3 \cdot CuI$ and $AsEt_3 \cdot AgI$. Fourfold mols. [e.g., $Cu_4I_4(AsEt_3)_4$] are necessary to describe the structure; details are: space-groups $I\bar{4}3m$, $C3c$, and $I4m2$ or $142m$; cells cubic, a_0 13.08, trigonal, c_0 23.7, a_0 22.4, and tetragonal, c_0 19.7, a_0 10.7 Å.; respectively, for the three compounds.

B. W. R.

Structure of aromatic compounds. I. Acenaphthene. K. BANERJEE and K. L. SINHA (Indian J. Physics, 1937, 11, 21—35).—Acenaphthene crystals are orthorhombic bipyramidal; four mols. in the unit cell. The mol. has a plane structure. Analysis of the estimated intensities of X-ray reflexions from a no. of planes, in conjunction with magnetic data, proves that the two-fold axis of the mol. lies parallel to the b axis and that the mol. plane is inclined at 26° to the c face. The distance between an aliphatic C and its neighbouring aromatic C is 1.47 Å., whilst that between two aliphatic C is 2.01 Å. The angle between an aliphatic linking and an aliphatic-aromatic linking is 97° , and those between aliphatic-aromatic linkings and adjacent linkings in the $C_{10}H_8$ nucleus are 114° and 126° .

W. R. A.

Crystallographic constants of benzylidene-ketopinene. T. BIALAS (Arch. min. soc. sci. Varsovie, 1934, 10, 90—97).— $C_{17}H_{20}O_2$ forms orthorhombic pseudotetragonal crystals ($a:b:c = 0.994:1:1.573$). CH. ABS. (e)

The n -fatty acids and certain of their derivatives. F. FRANCIS, F. J. E. COLLINS, and S. H. PIPER (Proc. Roy. Soc., 1937, A, 158, 691—718).—Crystal spacings, m.p., and setting points of n -fatty acids and their derivatives having even C content between 28 and 38, and the single acid with 46 C, are given. A linear relationship between crystal spacing and C content of the acids and their derivatives is observed.

G. D. P.

Modifications and transformations of metals on heating in a vacuum or in different gases. I, II. J. J. TRILLAT and S. OKETANI (J. Phys. Radium, 1937, [vii], 8, 59—66, 93—98).—I. The surface changes occurring in pure metals on heating in vac. or in various gases have been examined by electron diffraction. At $<550^\circ$ no change is found in the surface of Au. When warmed above this temp. for 2 hr. there is a change in the colour of the light transmitted by the foil, and a supplementary annular diffraction pattern is obtained at certain points on the surface. This supplementary pattern becomes more marked as the temp. is raised, and numerous spots appear with hexagonal symmetry (modification B). These always occur in the thinnest parts of the film, and indicate that there is a superficial mobility of atoms at temp. m.p. (cf. Andrade, A., 1935, 1307, 1449). If the temp. is raised to 700° , or if heating at 600° in vac. is prolonged, recrystallisation of the Au occurs, with the formation of large Au crystals oriented in certain directions. This occurs more easily in the thicker parts of the film. All the above effects are the same whether the heating is carried out in vac., air, N_2 , O_2 , or A. The origin of modification B is discussed.

II. Au. containing very small amounts of Ag and Cu gives the same diffraction pattern as pure Au, and modification B is formed when heated in vac., N_2 , or A. When heated in air or O_2 , a supplementary diagram (diagram O) appears, and is given by the whole surface of the foil. It is the more marked the higher is the temp., and disappears slowly when the film is maintained at room temp. The removal is accelerated by heating in vac. to 450° . Diagram O is due to a Au oxide, the formation of which is catalysed by the more easily oxidisable Cu. The structure of thin films of Ag was examined. At room temp. a fibrous structure was found, which became microcryst. after heating for 2 hr. at 500° . At the same time new rings appeared in the diagram, ultimately breaking into spots. This new structure is identical with structure B of Au. Pt, Cu, and Al do not give any new modification when heated in vac. or in inert gases. The effect of passing electron beams through thin metallic foils for prolonged periods was examined. With Au the primary intense diffraction pattern gradually became weaker, and on keeping for 24 hr. after exposure to the beam, the original intensity was not regained. Intense diagrams were, however, obtained from neighbouring spots of

the film. The phenomenon is due to a local thickening of the film owing to the mobility of superficial layers at the temp. to which they are raised by the electron beam. A. J. M.

Structure of thin metallic films deposited at low temperatures. G. HASS (*Naturwiss.*, 1937, 25, 232—233).—Electron diffraction experiments have been carried out with thin films of Ag and Sb deposited at -175° in the diffraction tube itself. For Ag a no. of strong interference rings were obtained; they became sharper as the temp. was raised, indicating crystal growth. This crystallisation with rising temp. was more noticeable with thin than with thicker films. With Sb only two diffuse, weak rings were obtained at low temp., corresponding with a colloidal structure. At room temp. large crystals with a thread structure were present, the diffraction rings becoming sharper and more numerous. The results do not agree with the theory that the films are amorphous at low temp. (Zahn *et al.*, *A.*, 1934, 16) or that there is a transition temp. from one form to another (Kramer, *ibid.*, 244). A. J. M.

Electron diffraction examination of precipitated metals and their alloys. G. NATTA (*Gazzetta*, 1937, 67, 10—22).—The electron diffraction method is more suitable than the X-ray method for investigating the structure of colloidal and pptd. metals and of thin metallic films. Colloidal Au has the usual face-centred cubic lattice. Purple of Cassius also shows lines due to SnO_2 . When pptd. by CH_2O or N_2H_4 , Au, Pt, and Pd have lattice consts. which are equal to or about 0.01 \AA . > the vals. given in the literature. Thin films (about 10^{-5} — 10^{-6} cm.) of Pd, Ag, and Au deposited on Cu from solutions of their ions have lattice consts. of 3.67—3.71, 4.02, and 4.01—4.07 \AA ., respectively; and consist of solid solutions of Pd in Cu, Cu in Ag, and Cu in Au. The film of metal obtained by depositing one metal on a more electro-positive one is compact and adherent only when a solid solution is formed. O. J. W.

Molecular structure of inorganic fluorides from electron diffraction measurements. H. BRAUNE and P. PINNOW (*Z. physikal. Chem.*, 1937, B, 35, 239—255).—The structure and the internuclear distances have been determined. UF_6 , WF_6 , and probably also MoF_6 mols. have rhombic symmetry. SiF_4 is tetrahedral. The PF_5 mol. is a symmetrical double pyramid. In IF_5 all the distances I—F are equal, and the radius of the I^{5+} ion is 1.46 \AA . BF_3 is planar. R. C.

Electron diffraction investigation of some vinyl polymerides. G. NATTA and R. RIGAMONTI (*Atti R. Accad. Lincei*, 1936, [vi], 24, 381—388; cf. *A.*, 1934, 993).—Electron diffraction by the following substances has been investigated: polyvinyl chloride, bromide, acetate, and alcohol, polystyrene, and polydichloroethylene. The last two have a definitely cryst. structure. All the substances show characteristic distances of 2.13—2.27 and 1.20—1.26 \AA . O. J. W.

Investigation of unimolecular films by electron diffraction. E. HAVINGA and J. DE WAELE (*Rec. trav. chim.*, 1937, 56, 375—381).—Unimol.

films of Ba salts of fatty acids are examined, after transference from a H_2O surface to a film of cellulose nitrate or Au leaf. They show hexagonal symmetry, and may be regarded as "two-dimensional single crystals." The C chains are perpendicular to the surface, with the polar groups towards the supporting film. The separation of the chains is 4.78—4.80 \AA ., from which the surface area per mol. is 19.9 \AA^2 , compared with Langmuir and Adam's val. 20.0 \AA^2 ; thus in transferring the film no change has taken place. F. J. L.

Piezo-electric constant of quartz. J. CLAY and J. G. KÄRPER (*Physica*, 1937, 4, 311—315).—The piezo-electric charge α pressure up to 10 kg. per sq. cm., and α temp. (17 — 90°). H. J. E.

Variation of the piezo-electric modulus of quartz as a function of temperature. A. LANGEVIN (*J. Phys. Radium*, 1936, [vii], 7, 95—100).—The piezo-electric modulus of quartz decreases linearly with temp. between 20° and 300° , decreasing by 10% between those temp. Conflicting results of earlier workers are due to irregularities in the transmission of the compressing force to the crystal. O. D. S.

Magnetostriction of iron crystals at high temperatures. H. TAKAKI (*Z. Physik*, 1937, 105, 92—103).—The first const. C of elongation of Fe crystals in the direction of the tetragonal axis at saturation increases with temp. up to 500° and then falls sharply, disappearing completely at the Curie point. The second const. χ of elongation decreases along the trigonal axis up to 500° and then disappears rapidly. These results agree with theory and can be related to the variation of the anisotropic const. with temp. H. C. G.

Magnetic powder experiments on rolled nickel iron. II: J. L. SNOEK and M. W. LOUWERSE (*Physica*, 1937, 4, 257—266; cf. *A.*, 1936, 413).—Observations on polished surfaces in the zx - and yz -planes, and additional observations on the rolling plane, are recorded. H. J. E.

Torsion in an iron or nickel wire facilitates discontinuities of magnetisation with an axial alternating current. S. PROCOPIU and G. VASILIU (*Compt. rend.*, 1937, 204, 971—973).—The effect (this vol., 227) occurs at lower I with increasing torsion. A. J. E. W.

Charge separation in a mass as a result of the pressure gradient due to the application of very high pressures. (The origin of the earth's magnetic and electric fields.) H. HAALOK (*Z. Physik*, 1937, 105, 81—87).—A quasi-theoretical discussion on the origin of the earth's magnetic and electric fields based on separation of charges as a result of pressure gradients along the earth's radius. L. G. G.

Optical constants of several metals in vacuum. H. M. O'BRYAN (*J. Opt. Soc. Amer.*, 1936, 26, 122—127).—Data for n , reflecting power at normal incidence, extinction coeffs., dielectric consts., and at rates of absorption for Be, Mg, Ca, Sr, Ba, Al, Ge, La, Ce, and Mn, evaporated in vac. on to thin glass plates, and with a special Hg arc light source, are tabulated and discussed. N. M. B.

Molecular, nematic, and crystal states of 1:1'-diethyl- ψ -cyanine chloride. E. E. JELLEY (*Nature*, 1937, 139, 631—632; cf. this vol., 63).—The application of spectrographic, ultramicroscopic, and streaming birefringence methods to the ageing of aq. solutions of this dye in presence of NaCl shows that the dye passes from the dissociated state through a mol. phase of brief duration to form thin threads. The optical properties of these threads and of thin needle crystals of the dye indicate that the threads are cryst. only in one direction, and correspond with the nematic type of liquid crystal. The η abnormalities described by Scheibe *et al.* (*ibid.*, 165) are explained not by polymerisation of ions of the dye but by the existence of nematic aggregates of dye mols.

L. S. T.

Elastic properties of sulphur trioxide. H. GERDING (*Naturwiss.*, 1937, 25, 251).—SO₃ possesses elastic properties at low temp. owing to polymerisation and the consequent formation of long chain-like mols.

A. J. M.

Absorption of strain energy in metals. N. A. DE BRUXNE (*Nature*, 1937, 139, 633).—There is a linear relation between the Debye temp. θ of a metal and the logarithm of the ratio of the energy absorbed to that stored.

L. S. T.

Transformations of higher orders. N. F. MOERMAN and G. J. MULLER (*Physikal. Z.*, 1937, 38, 298—302).—In disagreement with Justi *et al.* (*A.*, 1936, 926) the transformations of the three solid modifications of H₂S (α , β , γ) may be treated as transformations of the first kind. Conditions governing transformations of higher orders are discussed.

A. J. M.

Transformations of higher orders. E. JUSTI and H. NITKA (*Physikal. Z.*, 1937, 38, 302—303).—A reply to criticism (cf. preceding abstract).

A. J. M.

Velocity of polymorphic transformation of α - and β -ammonium nitrate. V. K. PERSCHKE and A. N. POPOV (*J. Gen. Chem. Russ.*, 1937, 7, 363—368).—The velocity of mutual transformation is a function of the no. of active centres, and varies with the rate of heating and the H₂O content of the NH₄NO₃.

R. T.

Supposed allotropy of liquid benzene. E. COHEN and J. S. BUIJ (*Z. physikal. Chem.*, 1937, B, 35, 270—284; cf. *A.*, 1934, 480, 722).—Determinations of d at 20—60° and the sp. heats at 8—24° give no evidence of allotropy.

R. C.

***cis*-Cinnamic acids. II.** F. EISENLOHR and A. METZNER (*Z. physikal. Chem.*, 1937, 178, 339—349; cf. *A.*, 1935, 916).—The various forms retain their individuality in the dissolved state. The heats of combustion are: form of m.p. 42°, 7046; form of m.p. 58°, 7055; form of m.p. 68°, 7071 g.-cal. per g. Pressure converts the acid m.p. 68° into the form m.p. 58° or, after a long time, into the acid m.p. 42°. The m.-p. diagrams of the *trans*-acid with the three forms of the *cis*-acid are all different. In the molten state the stable form is that of m.p. 42°.

R. C.

Expansion of *p*-azoxyphenetole and nature of the phase change, mesomorphic to isotropic liquid state. E. BAUER and J. BERNAMONT (*J.*

Phys. Radium, 1936, [vii], 7, 19—22).—Vol.-temp. and coeff of expansion-temp. curves show discontinuity at 165.5—167.7°, the transition point, mesomorphic \rightarrow isotropic liquid state, indicating a true change of phase.

F. J. L.

Transformation of solid metal phases. VI. Allotropic transformation. U. DEHLINGER (*Z. Physik*, 1937, 105, 21—35; cf. *A.*, 1933, 896).—The energy changes of individual atoms are considered thermodynamically and the proportions of both phases present in equilibrium expressed as a function of temp. Introduction into the equation of a parameter (W), representing the free energy of strain in the crystal lattice when partial change has occurred, leads to a sharp transition point. The proportion of either phase present above or below this point depends on the magnitude of (W). A relation between temp. and velocity of transformation is deduced and the general mechanism of transformation both on the surface and inside the crystal considered.

H. C. G.

Allotropy of iron. H. ESSER (*Iron & Steel Inst. Carnegie Schol. Mem.*, 1936, 25, 213—234).—The A3 transformation temp. rises as the purity of the Fe increases, and the intensity simultaneously decreases. Experiments carried out to ascertain the dependence of the transformations on the degree of purity, particularly those concerned with the effect of H₂ (doubling of the A3 point), suggest that the allotropy of Fe is not an inherent, but an imposed, characteristic.

A. J. K.

Mechanico-chemical determination of mol. wt. of liquids boiling at constant pressure. G. DUON (*Ann. Guéhard-Séverine*, 1936, 12, 102—119).—Determinations of the d and surface tension, γ , of liquids at the b.p. are described. A relation between the mol. wt., d , and γ of members of homologous series is verified.

J. G. A. G.

Resistance of boron. E. PODSZUS (*Ann. Physik*, 1937, [v], 29, 61—62).—Measurements of the resistance of B at temp. up to 2000° by various workers are considered and it is concluded that the previously suggested existence of B in two different modifications is not established.

A. E. M.

Contribution to the electrical resistance of metals from collisions between electrons. W. G. BABER (*Proc. Roy. Soc.*, 1937, A, 158, 383—396).—The theory of electrical conductivity due to Bloch and others neglects the interaction between the conduction electrons. The contribution to resistivity arising from collisions is shown to vary as T^2 . This term is negligible down to 1° abs. for normal metals but is appreciable for transition metals Pd and Pt, in agreement with experiment.

G. D. P.

Electrical conductivity of thin metallic films. II. Cæsium and potassium on Pyrex glass surfaces. E. T. S. APPELYARD and A. C. B. LOVELL (*Proc. Roy. Soc.*, 1937, A, 158, 718—728; cf. this vol., 121).—The resistivity of films from 0.3 to 50 Å. thickness is measured. The decay of conductivity shown by films is investigated. At 64° abs. Cs films of only a few Å. thickness are stable. The resistivity-thickness and resistivity-temp. curves are in good agreement with theory.

G. D. P.

Experimental determination of the free path of electrons in lead and cadmium. L. RIEDEL (Ann. Physik, 1937, [v], 28, 603—631).—Measurements have been made of the resistance at 20–33° abs. of Pb and Cd wires of diameter from 1 to 25 μ . It is calc. that the mean free paths of electrons in Pb and Cd are respectively 63 and 292 Å., and that the corresponding nos. of free electrons per atom are 1.0 and 0.34. O. D. S.

Superconducting state. F. LONDON (Physical Rev., 1937, [ii], 51, 678—679; cf. Slater, this vol., 174).—A theory based on stationary waves by which a transport of electricity can be effected only in the presence of a magnetic field is discussed for the interpretation of supercurrents. N. M. B.

Disturbance of the superconductive state by a magnetic field; supplementary measurements. W. J. DE HAAS and (Miss) A. D. ENGELKES (Physica, 1937, 4, 325—328; cf. A., 1936, 929).—Measurements with a Sn sphere with Bi wires on the equator and in the canal, and on a monocryst. Sn wire are given. H. J. E.

Types of carrier electrons in superconduction. R. FORRER (J. Phys. Radium, 1937, [viii], 8, 67—80; cf. A., 1936, 1056).—Electrons responsible for superconduction are the *s* electrons of the outermost incompleated shells. The electronic lattices of superconducting alloys (Hg_5Tl_2 , Tl_2Pb , Bi_2Tl , Sb_2Tl , Au_2Bi) are considered and shown to conform to this rule. Absence of *s* electrons in the outermost shell makes superconduction impossible, so that those elements or alloys in which all the valency electrons are used in the electronic lattice (e.g., Hume-Rothery alloys) are not superconductors. The electronic lattices of the non-superconducting CuZn_3 , AgZn_3 , Cu_3Sn , AuSn , PbSe , and PbS confirm this rule. It is predicted that SnTe will be superconducting, and Cu_2Sb not. A hypothesis of the mechanism of superconduction supposes that the *s* electrons below the transition temp. (*T*) are linked together in a lattice superimposed upon the principal electronic lattice. Comparison with ferromagnetism indicates that *T* is analogous to the Curie point. A. J. M.

Structure of the electron and superconductivity. J. STARK (Physikal. Z., 1937, 38, 269—277).—The conclusions respecting the structure of the electron which may be drawn from a study of magnetic induction in superconductors are discussed. If the electron has an annular structure, the electron moving within the ring without resistance, a superconductor should be paramagnetic, although there is a diamagnetic induction which may mask the paramagnetic effect. The theory of an experiment to determine the magnetic induction in superconductors is given. A. J. M.

Magnetic induction in superconductors. J. STARK and K. STEINER (Physikal. Z., 1937, 38, 277—283; cf. preceding abstract).—The magnetic induction in superconductors was determined with tubes of Sn, Sn + 1% Cd, and a single crystal of Sn. The dependence on field strength of the induction changes when superconductivity commences was found, the results agreeing with the existence of a paramagnetic

and a diamagnetic induction, as required by the theory that the electron has an annular structure. The paramagnetic magnetisation for polycryst. superconductors is $>$ for single crystals, and also varies with the previous heat-treatment of the metal.

A. J. M.

New phenomenon in the superconducting transition of tantalum and tin. F. B. SILSBEE, R. B. SCOTT, and F. G. BRICKWEDDE (J. Res. Nat. Bur. Stand., 1937, 18, 295—314).—A sudden increase in resistance (*R*), up to 75% of the normal, has been observed with Sn and Ta on passing from the superconducting to the normal state by changing the temp., current, or magnetic field, relatively large currents being necessary. The sudden increase in *R* is followed by a slow decrease. The cause of the "overshoot" is discussed. R. S. B.

Electrical conductivity of a superconducting sphere in the intermediate state. L. SCHUBNIKOV and I. NAKHUTIN (Nature, 1937, 139, 589—590).—A spherical single crystal of Sn in the intermediate superconducting state, i.e., when the magnetic permeability no longer equals 0, possesses anisotropic superconductivity. With a current direction parallel to the external field the sphere remains superconducting even when the magnetic permeability is near unity, and with a direction perpendicular to the field superconductivity disappears at a field strength of approx. $2/3H_c$. L. S. T.

Thermo-electric force of a superconductor against the same metal in the non-superconductive state. J. A. KOK (Physica, 1937, 4, 276—278).—Theoretical. H. J. E.

Bismuth crystals. IV. Alteration of the thermo-electric power on transition from transverse to longitudinal magnetic field. E. GRUNELSEN and J. GIELESSEN (Ann. Physik., 1937, [v], 29, 25—32; cf. this vol., 121).—The variation produced by a magnetic field in the thermo-electric e.m.f. for Bi crystals in contact with manganin and constantan at -182° has been measured. The effect varies with the orientation of the Bi crystal in the field and reaches a max. when the field is perpendicular to, and a min. when the field is parallel to, the trigonal axis. The relation between this effect and the variation in heat-conductivity of Bi crystals in a magnetic field is illustrated graphically. H. C. G.

Influence of mechanical strains on the ferromagnetic properties of cubic single crystals. K. SCHLECHTWEIG (Ann. Physik, 1937, [v], 28, 701—720).—Theoretical. O. D. S.

Anomalous diamagnetism of selenium. M. PRASAD and S. S. DHARMATTI (Indian J. Physics, 1937, 11, 1—8).—The effect of powdering and colloidalisation on the diamagnetic susceptibility of Se has been determined by a Curie balance method. Increased time of powdering in air leads to a decrease in diamagnetism followed by the appearance of paramagnetism, and the colour of Se changes from grey to pink and finally to red. Sols prepared under varying conditions have also been examined. The anomalies are due principally to impurities formed by contact

with the air but conversion into the allotropic red forms also contributes.

W. R. A.

Magnetochemistry of silver and copper; bivalent ions and mixed crystals. N. PERRAKIS and L. CAPATOS (J. Phys. Radium, 1936, [vii], 7, 391—400).—Bivalent ions of Ag and Cu exhibit a negative Curie point and have magnetic moments of 9.78 and 9.11 Weiss magnetons, respectively. Mixed crystals of the two ions have been investigated throughout the temp. interval from room temp. to approx. -80° and they obey the Weiss law. Introduction of a small quantity of either metal lowers the Curie point of the constituent present in excess by an amount \propto the concn.

W. R. A.

Paramagnetism of anhydrous cobalt chloride in the pure state, and in solution in cadmium chloride or manganous chloride. C. FEHRENBACH (J. Phys. Radium, 1937, [vii], 8, 11—22).— CoCl_2 exists in two magnetic states, in both of which it obeys the Weiss law: Below 409° abs. the at. Curie const., C_1 , is 3.342, and the Curie point, θ , is 30° . Above 409° abs. C_1 is 3.101, and θ is 60° . The difference in moments of the two forms is approx. 1 Weiss magneton. Another form, for which $1/\chi$ was not $\propto T$, obeyed the law of Cabrera, $(\chi + a)(T - \theta) = C$, where a represents a const. superimposed diamagnetism. Mixed crystals of CoCl_2 and CdCl_2 in various proportions, obeyed Weiss' law like CoCl_2 , over two temp. ranges. The Curie consts. increase linearly with $[\text{CdCl}_2]$. θ decreases and ultimately becomes negative as $[\text{CdCl}_2]$ increases. Mixed crystals of CoCl_2 and the paramagnetic MnCl_2 gave similar results. The Curie points are given by $\theta = m_1\theta_1 + m_2\theta_2$, where θ_1, θ_2 are the Curie points of MnCl_2 and CoCl_2 , respectively, and m_1, m_2 are the concns.

A. J. M.

Variation of the magnetic susceptibility of hæmatite powder as a function of the size of the grains. R. CHEVALIER and (Mlle.) S. MATHIEU (Compt. rend., 1937, 204, 854—856).— χ for three specimens of hæmatite decreased rapidly with decreasing particle size, the change being most marked for diameters < 50 μ . For fine powders, χ approached the val. for artificial rhombohedral Fe_2O_3 .

A. J. E. W.

Magnetic properties and structure of ferrihæmoglobin (methæmoglobin) and its compounds. C. D. CORYELL, F. STITT, and L. PAULING (J. Amer. Chem. Soc., 1937, 59, 633—642).—Measurements at 24° lead to vals. of the paramagnetic part of the mol. susceptibility which correspond with the following vals. of the effective magnetic moment per heme, in Bohr magnetons: ferrihæmoglobin (I) 5.80, and its hydroxide (II) 4.47, fluoride (III) 5.92, cyanide (IV) 2.50, and hydrosulphide (V) 2.26. For (I) and (III) these correspond with 5 unpaired electrons per heme, indicating essentially ionic linkings; for (IV) and (V) to 1 electron, indicating covalent linkings; and for (II) to 3 electrons, indicating linkings of an intermediate type. The dissociation consts. of (II), (III), and (IV) have been determined by magnetic titrations.

E. S. H.

Theory of the absorption of sound in polyatomic gases. M. A. LEONTOVITSCH (Bull. Acad.

Sci. U.R.S.S., 1936, 633—642).—Mathematical. The application to liquids is discussed.

O. D. S.

Acoustic spectrum of liquids. (Sir) C. V. RAMAN and B. V. R. RAO (Nature, 1937, 139, 584—585).—Fabry-Perot patterns with 4358 Å. radiation scattered by PhOH , COMe_2 , and BuOH are discussed.

L. S. T.

Absorption and diffusion of supersonic waves and the structure of liquids. R. LUCAS (J. Phys. Radium, 1937, [vii], 8, 41—48).—The absorption of supersonic waves in liquids is $>$ that demanded by the theory of Stokes and Kirchhoff, the elastic heterogeneity of the liquid playing an important part, independent of viscosity. The diffusion of elastic waves in liquids is discussed. The comparatively large vals. of the absorption and diffusion could be explained by supposing liquids to have a subcryst. structure.

A. J. M.

Thermal properties of heavy and light hydrogen at low temperatures. A. EUCKEN (J. Phys. Radium, 1936, [vii], 7, 281—288).—A résumé.

H. J. E.

Specific heat of liquids and their constitution. L. BRILLOUIN (J. Phys. Radium, 1936, [vii], 7, 153—157).—Theoretical. Monat. liquids have a sp. heat of about $3R$ near the m.p., which decreases to $2R$ at the crit. point. Such liquids have a cryst. microstructure at low temp., and approach the ideal at the crit. point.

H. J. E.

Heat capacity, entropy, and free energy of the vapour of phosphorus P_2 . I. GODNEV and A. SVERDLIN (J. Phys. Chem. Russ., 1936, 8, 904—908).—Spectroscopic data are used for calculating thermodynamic properties of P_2 .

J. J. B.

Calorimetric determinations of the transition of the anisotropic liquid phase to the isotropic. K. KREUTZER and W. KAST (Naturwiss., 1937, 25, 233—234).—The heat of transition from the anisotropic to the isotropic liquid state of *p*-azoxyanisole is 1.6 g.-cal. per g. (410 g.-cal. per g.-mol.), and c_p for the anisotropic liquid is $>$ that for the isotropic by 0.037 g.-cal. per g. The corresponding difference in c_v is 0.016 g.-cal. per g. For *p*-azoxyphenetole the heat of transition is 2.9 g.-cal. per g. (830 g.-cal. per g.-mol.), and the difference in c_p for the two states is 0.11 g.-cal. per g.

A. J. M.

Conditions for the occurrence of an anisotropic liquid phase. W. KAST (Naturwiss., 1937, 25, 234—235).—The small difference in sp. heat of a substance in the anisotropic and isotropic liquid states (see preceding abstract) does not agree with the assumption that in the isotropic state the mols. become capable of completely free rotation, but would allow the free rotation of the terminal groups of the mol. about the axis of the mol. The hindrance to free rotation of the terminal groups in the anisotropic state is determined by the interaction between the dipole moments of these groups and that of the middle of the mol. By increasing the mass of the terminal group the temp. necessary for it to reach a sufficiently large amplitude is increased, agreeing with the experimental fact that such mols. have a wider temp. range for the anisotropic state.

A. J. M.

B.p. of organic compounds. I. Formula of Boggio-Lera. II. Properties of paraffins. A. H. W. ATEN (J. Chem. Physics, 1937, 5, 260—263, 264—267).—I. The formula $T = (nD + B)^{\frac{1}{2}}$ for the b.p. (T) abs. of the mono-derivatives of the paraffin series, where n is the no. of CH_2 groups in the mol. and D and B are consts. for a given series (Boggio-Lera, A., 1899, i, 843), is tested for the paraffin series and 11 series of mono-derivatives. For all these D has a const. val. of 20,500 and B has different vals. dependent on the nature of the terminal groups. The formula holds also, $D = 20,500$, for five series $\text{R}[\text{CH}_2]_n\text{R}$ and for methylparaffins and dialkylparaffins. For cycloparaffins the same formula holds if $D = 24,300$ and $B = 18,000$. In all cases there must be ≤ 3 C in the chain.

II. Utilising Langmuir's ideas concerning the evaporation of liquids at their b.p. and the rules on the cohesion of liquids, the formula of Boggio-Lera is derived for paraffins, and this formula is applicable to all paraffins containing > 3 and < 20 C in the chain.

W. R. A.

Exchange of energy between organic molecules and solid surfaces. II. Accommodation coefficients and specific heats of paraffin hydrocarbons and the influence of temperature on the accommodation coefficients (including argon) at some 10^{-6} mm. (Hg) pressure. O. BEECK (J. Chem. Physics, 1937, 5, 268—273).—The investigation of the accommodation coeffs. (α) of various paraffins and their relation to sp. heats has been extended to various temp. of the bright Ni surface and to various gas temp. The results agree with the general formulæ (this vol., 21) relating α to the mol. wts. and sp. heats. Kassel's calc. vals. of C_p of C_3H_8 and C_4H_{10} give satisfactory agreement if the contributions of the deformation frequencies of the C chain are omitted.

W. R. A.

Mathematical foundation of the thermodynamical equation of state. W. JACYNA (Physical Rev., 1937, [ii], 51, 677).—Mathematical. N. M. B.

Properties of the condensed phases of helium and hydrogen. A. BJL (Physica, 1937, 4, 329—344).—Theoretical. The influence of the zero point motion on crystal d is discussed.

H. J. E.

Vapour pressure of certain terpenes. G. A. RUDAKOV and S. J. KOROTOV (J. Appl. Chem. Russ., 1937, 10, 312—318).—The v.p. of α -pinene, Δ^3 -carene, camphene, limonene, and dipentene at 25—760 mm. and of isobornyl acetate and formate at 25—200 mm. are given by $\log P = A/T + B$, where T is abs. temp., and A and B are consts.

R. T.

Critical product of pure normal liquids. R. LAUTIE and S. ARTIERES (Bull. Soc. chim., 1937, [v], 4, 664—667; cf. A., 1936, 1330).—It is shown that, for a series of halogen derivatives, the mol. surface energy at the b.p. (E) and also the crit. product (P) (= crit. pressure \times crit. mol. vol.) are approx. linear functions of E and P , respectively, for the corresponding rare gases. Data for the halogens and for mono-halogenated benzenes are recorded.

H. J. E.

Rate of evaporation of barium oxide. G. HERRMANN (Z. physikal. Chem., 1937, B, 35, 298—

308).—The rate of evaporation of a coating of BaO on Pt, Ni, Au, or Cu is not affected by the metal. The v.p., in mm. is given by $\log p = -2.60 \times 10^4/T + 13.44$, and the mol. heat of vaporisation is 119,000 g.-cal. For $\lambda = 0.65 \mu$ the radiation coeff. is 18—30% that of a black body. At high temp. BaO seems to be partly reduced to Ba by Ni on which it is coated, reduction apparently occurring either in the vapour phase or at the moment of release from the crystal lattice. This reaction seems to be responsible for certain differences in behaviour between Ni and Pt as bases for a BaO layer.

R. C.

Thermal conductivity in relation to crystal structure. W. A. WOOSTER (Z. Krist., 1936, 95, 138—149).—The conductivity in a given direction of several crystals, not of the layer or chain types, is roughly given by $\Sigma S \cos^2 \theta$, where there are S similar linkings making an angle θ with the direction considered. For the layer crystals examined, the conductivity is greater along than perpendicular to the layer; for chain lattice crystals it is greater along the chains.

B. W. R.

Exchanges of energy between a platinum surface and hydrogen and deuterium molecules. W. B. MANN and W. C. NEWELL (Proc. Roy. Soc., 1937, A, 158, 397—403).—The accommodation coeffs. relative to a cleaned Pt wire at 100° are 0.11 for H_2 , 0.16 for D_2 , and about 0.05 for He. Figures are also given for the coeffs. relative to a saturated wire. The Na method of prep. of D_2 is described.

G. D. P.

Viscous properties of polyisobutylene. J. D. FERRY and G. S. PARKS (Physics, 1935, 6, 356—362).—The η was determined from 70° to 175° and from -53° to 24° by the falling-sphere and concentric-cylinder methods, respectively. η was 19 poises at 175° , 10^{10} at -53° , and 10^{13} at -76° .

CH. ABS. (e)

Streaming of liquids through small capillaries. H. B. BULL and J. P. WRONSKI (J. Physical Chem., 1937, 41, 463—468).—The rate of flow of H_2O , n -aliphatic (C_1 — C_7) alcohols, and CCl_4 through diaphragms of sintered glass, cellulose, and graphite is a linear function of pressure, and for a given pressure is a function of η and the degree of attraction between liquid and diaphragm. The crit. pore radius below which flow becomes anomalous is between 8.85 and 3.12×10^{-4} cm.

C. R. H.

Oiliness of liquids. IV. Measurements of the static friction coefficients by the method of inclination. J. SAMESHIMA and Y. TSUBUKU (Bull. Chem. Soc. Japan, 1937, 12, 127—132).—Coeffs. have been determined for H_2O , the straight-chain alcohols and the acids previously measured (this vol., 72). Vals. of both coeffs. decrease with lengthening C chain for the alcohols but remain const. for the acids. Results are interpreted in terms of affinities between the polar groups and glass.

F. R. G.

Comparison of the rates of diffusion of hydrogen and deuterium through heated platinum. R. JOUAN (J. Phys. Radium, 1936, [vii], 7, 101—106).—The ratio of the rates of diffusion of D_2 and H_2 through Pt is 0.75 from 550° to 950° .

O. D. S.

Thermal expansion of binary systems in the molten state. A. A. LEONTEVA (*Acta Physicochim. U.R.S.S.*, 1937, 6, 229—238; cf. this vol., 177).—The sp. vols. of various molten mixtures in the systems $K_2B_4O_7$ - B_2O_3 , KPO_3 - $Na_2B_4O_7$, $NaPO_3$ - $NaBO_2$, and $NaPO_3$ - $Na_2B_4O_7$, have been determined. The mixtures show contraction in vol. and the formation of dipole complexes, often with dipolar linkings within the complex. The degree of association of the mols. and the possibility of complex formation are almost independent of temp., being determined mainly by the proportions of the components present.

J. W. S.

Viscosity of ideal mixtures. G. P. LUTSCHINSKI (*J. Phys. Chem. Russ.*, 1936, 8, 830—834).—The equation of Batschinski (A., 1913, ii, 928) is transformed so as to be applicable to mixtures formed without vol. contraction.

J. J. B.

Diffusion, viscosity, and intermolecular action in binary mixtures of liquids. H. LEMONDE (*J. Phys. Radium*, 1936, [vii], 7, 371—378).—Measurements of the diffusion and η have been made for the binary mixtures, H_2O -MeOH, H_2O -EtOH, H_2O -PrⁿOH, $CHCl_3$ - Et_2O , $CHCl_3$ - $COMe$, and C_6H_6 -EtOH. In dil. solutions the coeff. of diffusion is a function of the structure of the mols., the η of the solvent, and the no. of mols. per unit vol. The product $D\eta$ varies with the composition of the mixture and these variations can be interpreted in terms of intermol. association. $D\eta$ is also the motive force of diffusion which depends on the intermol. forces of attraction or repulsion. Comparison of the isotherms of diffusion and v.p. verifies the inverse variation of these two quantities in the mixture and indicates the direction of the variation of D with concn.

W. R. A.

Diffusion in liquids. XI. Inter-diffusion of electrolyte solutions. T. LINHART (*Z. Physik*, 1937, 105, 45—55).—Sitte's method for measuring diffusion in coloured liquids has been improved and applied to the inter-diffusion of aq. electrolytes. Rates of diffusion of $KMnO_4$ and $CoCl_2$ in H_2O and other aq. electrolytes have been compared. Differences as much as 4—5% were observed only when mobilities of corresponding ions of the inter-diffusing electrolytes differed widely. Results agree with theory.

H. C. G.

Viscosities of liquid mixtures with pyrrole as a component. M. DEZELIC (*Trans. Faraday Soc.*, 1937, 33, 713—719).— η -composition curves have been obtained for mixtures of pyrrole (I) with C_5H_5N , piperidine, nicotine, quinoline, NH_2Et , $CHCl_3$, $AcOH$, Pr^iCO_2H , allylthiocarbimide, and $PhNO_2$. The first five, which form complexes with (I) and produce a rise of temp. on mixing, give curves which have a max. or are concave to the composition axis. The last five do not evolve heat on mixing, and give curves convex to the composition axis. The results indicate that the acid character of unsubstituted (I) predominates over the basic.

F. L. U.

Viscosity in the systems phenol-aniline and -pyridine. A. D. VINOGRADOVA, A. M. TRICHOMIROVA, and N. N. EFREMOV (*Bull. Acad. Sci. U.R.S.S.*, 1936, 1027—1043).—The composition- d , $-\eta$, temp.

coeff. of η , and -surface tension curves of the systems afford no evidence of the compound formation which is suggested by the fusion diagrams.

R. T.

Physico-chemical analysis of systems containing diamines. Viscosity and m.p. of the system ethylenediamine-methyl alcohol. M. S. ELGORT (*Bull. Acad. Sci. U.R.S.S.*, 1936, 495—505).—The m.p. curves indicate the formation of the compound $(CH_2NH_2)_2 \cdot 2MeOH$, which decomposes near its m.p. (—48°). The viscosity and the temp. coeff. of viscosity curves show marked max. at this composition.

D. C. J.

Determination of the composition of binary liquid systems examined by physico-chemical analysis. Stannic bromide-esters. N. S. KURNAKOV and E. B. SCHTERNIN (*Bull. Acad. Sci. U.R.S.S.*, 1936, 467—493).—The viscosity of mixtures of $SnBr_4$ with the Me and Et esters of HCO_2H , $AcOH$, oxalic and malonic acids, with Et ethylmalonate, and also with Et_2O has been determined. The sp. conductivity and the m.p. curves of mixtures of $SnBr_4$ and $EtOAc$ are recorded. Most of the compounds formed are shown in the m.p. curves. The max. of viscosity and the min. of sp. conductivity occur approx. at the composition of the least dissociated compound. Other deductions are made from the experimental results.

D. C. J.

Refraction in solutions. V. Complete refraction curve of carbamide. S. M. SCHERSCHEVER and A. I. BRODSKI (*J. Phys. Chem. Russ.*, 1936, 8, 890—895).— d and n have been measured for concns. up to 4N. The n -concn. curve is similar to that for electrolytes.

J. J. B.

Dielectric constants of ether-chloroform and ether-chlorobenzene mixtures. I. E. COOP (*Trans. Faraday Soc.*, 1937, 33, 583—590).—Dielectric const.-composition curves have been determined for Et_2O - $CHCl_3$ and Et_2O - $PhCl$ mixtures between 20° and —85°. The curves for the $PhCl$ mixtures are normal and indicate the absence of compound formation. In the Et_2O - $CHCl_3$ mixtures a well-marked max. at 50 mol.-% is observed, which becomes more pronounced as the temp. is lowered. Below —60° a secondary max. at $CHCl_3$ 67 mol.-% is developed. Of the two compounds, $Et_2O \cdot CHCl_3$ and $Et_2O \cdot 2CHCl_3$, thus indicated, the first is considered to be formed by co-ordination of O with the H rather than with the Cl atoms of the $CHCl_3$. The nature of this link is discussed.

F. L. U.

Ultra-violet absorption of binary liquid mixtures. XI. Ultra-violet absorption and orientation polarisation of the binary systems acetone-benzene and nitromethane-carbon tetrachloride. M. PESTEMER and O. FRUHWIRTH (*Monatsh.*, 1937, 70, 146—156).—For both systems the change in the orientation polarisation with concn. indicates considerable quadripole association of the polar components, which decreases with increasing dilution. As a consequence of this association both systems show deviations from Beer's law.

J. W. S.

Vapour pressure of binary solutions of isopropyl alcohol and benzene at 25°. A. L. OLSEN

and E. R. WASHBURN (J. Physical Chem., 1937, **41**, 457—462).—Partial and total pressure data are recorded. The system deviates in a positive manner from Raoult's law on account of the difference in polarity of the two components. C. R. H.

Vapour tension of mixtures of phosphoric and nitric acids. E. E. BABKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 193—196).—B.p. curves for mixtures of $\text{H}_3\text{PO}_4\text{--HNO}_3\text{--H}_2\text{O}$ are given for $p = 730$ mm. The partial pressures of HNO_3 are tabulated for mixtures containing 6—74% HNO_3 . O. D. S.

Vapour-liquid equilibria of certain binary mixtures of terpenes. G. A. RUDAKOV and S. J. KOROROV (J. Appl. Chem. Russ., 1937, **10**, 319—326).—B.p. and vapour composition are given for the systems camphene-*isobornyl* acetate, -*isobornyl* formate, - Δ^3 -carene, *isoborneol*-*isobornyl* acetate and formate, α -pinene- Δ^3 -carene and -dipentene at 100 mm. R. T.

Equilibria in solutions. II. B.p. under atmospheric pressure and vapour composition of binary mixtures of dichloroethane with ethylene chlorohydrin or ethylene oxide. S. I. KAPLAN, N. A. GRISCHIN, and A. A. SKVORTZOVA. **III. Solubility and vapour pressure of solutions of ethylene oxide in water or dichloroethane.** S. I. KAPLAN and A. S. REFORMATSKAJA (J. Gen. Chem. Russ., 1937, **7**, 538—544, 545—549).—II. The systems do not yield azeotropic mixtures.

III. Solubility and v.p. data are given for the range 0—20°. R. T.

System $\text{POCl}_3\text{--SO}_2\text{Cl}_2$. II. Vapour composition and pressure. G. P. LUTSCHINSKI and A. I. LICHATSCHEVA (J. Phys. Chem. Russ., 1937, **9**, 65—68; cf. A., 1936, 30).—V.p. at 0—60° are > the vals corresponding with the linear law. The concn. of POCl_3 in the gas is always < that in the liquid. E. R.

B.p.-composition diagram of the system dioxan-water. E. R. SMITH and M. WOJCIECHOWSKI (J. Res. Nat. Bur. Stand., 1937, **18**, 461—465).—There is a pronounced min. at 47—48 mol.-% dioxan, b.p. 87.82°. The normal b.p. of dioxan is 101.32°. F. J. G.

Calorimetry in binary liquid systems. (N. S. KURNAKOV and N. K. VOSKRESENSKAJA (Bull. Acad. Sci. U.R.S.S., 1936, 439—466).—The heat of mixing when plotted against mol. composition gives sharp max. at 50% for the systems $\text{C}_3\text{H}_5\text{--CNS}$ with piperidine and NHPhMe . SnCl_4 behaves similarly with HCO_2Et and with PrCO_2Et although the max. at 33% SnCl_4 are less sharp. $\text{SnCl}_4\text{--EtOBz}$ has a very flat max. SnBr_4 gives a sharp max., at 33% SnBr_4 , with HCO_2Et and also with EtOAc at 50%. With PrCO_2Et a very flat max. is found and a small heat effect observed with EtOBz . $\text{Et}_2\text{O--H}_2\text{SO}_4$ mixtures give a rounded max. at 50%. The results are compared with mol. vol. and viscosity changes in these systems. D. C. J.

Heat of mixing of diisobutylene and isooctane. W. D. KENNEDY and G. S. PARKS (J. Amer. Chem. Soc., 1937, **59**, 761—762).—Very small heat absorp-

tion occurs on mixing at 23°. The val. is a max. (12.1 ± 1.0 g.-cal.) when the mixture contains 0.49 mol. of isooctane. E. S. H.

System water-sulphur trioxide. H. C. S. SNETHLAGE (Chem. Weekblad, 1937, **34**, 320—321).—From a study of the rates of oxidation of $(\text{CH}_2\text{--CO}_2\text{H})_2$ and $\text{CH}_2(\text{CH}_2\text{--CO}_2\text{H})_2$ by CrO_3 in various concns. of H_2SO_4 at -40°, it follows that the hydrate $\text{SO}_3\cdot 3\text{H}_2\text{O}$ is the determining factor. S. C.

Metals and alloys. XXII. Alloy phases with the fluorite structure. E. ZINTL, A. HARDER, and W. HAUCKE (Z. physikal. Chem., 1937, **B**, **35**, 354—362; cf. this vol., 73).—The following alloy phases of the fluorite type have been examined: AuAl_2 , AuGa_2 (a 6.063), AuIn_2 (a 6.502), PtAl_2 (a 5.910), PtGa_2 (a 5.911), and PtIn_2 (a 6.353 A.). PtGa_2 and PtIn_2 are stable only at higher temp. R. C.

Theory of the diffusion of solids. J. CICHOCKI (J. Phys. Radium, 1936, [vii], **7**, 420—426).—The speeds of inter-diffusion of two metals in contact have been calc. An exponential equation, similar in form to the empirical relation $D = Ae^{-\frac{U}{RT}}$, has been derived and gives vals. in good agreement with experimental data. W. R. A.

Rates of diffusion in solid alloys. R. F. MEHL (J. Appl. Physics, 1937, **8**, 174—185).—A commentary on published data for diffusion in binary systems within single solid solution ranges, with special reference to alloys of Pb, Cu, Ag, and Au. C. R. H.

Occlusion and diffusion of hydrogen in metals. A metallographic study of nickel-hydrogen. G. A. MOORE and D. P. SMITH (Trans. Electrochem. Soc., 1937, **71**, Preprint 23, 249—267).—During electrolysis H_2 enters rolled Ni along fissured slip planes. H_2 in excess of that dissolved in the crystal lattice is retained in other fissures along planes parallel to the plane of rolling, i.e., dodecahedral planes, increasing gas pressure subsequently enlarging the fissures. It is suggested that the presence of the Beilby surface layer, by acting as a non-return valve, facilitates the penetration of H_2 into the underlying metal. The nature of the metallographic changes produced by H_2 are discussed and the systems Pd--H_2 and Ni--H_2 compared. J. W. C.

Density and atomic volume of aluminium-zinc alloys. A. S. FEDOROV (Ukrain. Chem. J., 1937, **12**, 61—63).—The curves exhibit a break at 40 at.-% Al. R. T.

Electron diffraction examination of Cu-Pt solid solutions obtained by precipitation. G. NATTA and A. GIURIANI (Gazzetta, 1937, **67**, 23—32; cf. this vol., 290).—Thin films of Pt deposited on Cu from H_2PtCl_6 solutions consist of solid solutions of Pt in Cu. The effect of varying the conditions of deposition on the composition of the solid solutions has been studied. O. J. W.

New type of solid solutions between metals. G. NATTA (Gazzetta, 1937, **67**, 32—38).—Films of Pt deposited from H_2PtCl_6 solutions on Ag foil consist at first of solid solutions in which the lattice const. is the same as for Ag, viz., 4.08 Å. This holds until the solutions contain >50 at.-% Pt. The lattice then

contracts and the const. reaches a val. which is characteristic of the stable solid solutions. The change takes place in a few days at room temp., in a few hr. at 90°, and in a few sec. at <500°.

O. J. W.

Range of validity of the Hume-Rothery rule. H. WITTE (Metallwirts.; 1937, 16, 237—245).—The range of existence of a no. of intermetallic compounds is plotted as a function of the valency electron concn. Phases of the γ -brass type agree better with the Hume-Rothery rule than those of the β -brass type. Compounds with a hexagonal dense-packed structure show considerable deviations.

C. E. H.

Quantum theory of the electrical conductivity of alloys in the superlattice state. II. T. MUTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 153—160; cf. A., 1936, 1332).—Theoretical.

H. J. E.

Iron-carbon constitutional diagram. I. Preliminary survey of the δ -region. F. ADCOCK (Iron and Steel Inst., April, 1937, Advance copy, 7 pp.).—A valve-energised high-frequency furnace has been used for the thermal analysis in vac. of the system Fe-0.003—1.01% C at 1550—1300°. The δ -phase is not formed in alloys containing >0.51% C. The data are compared with published results.

J. G. A. G.

Formation of the graphite eutectic in the iron-carbon alloy. T. SATO and S. NISHIGORI (Tetsu-to-Hagane, 1935, 21, 887—895).—The eutectic reaction in the pure Fe-C system (C 3.54—4.85%) takes place in two steps, differing by 7—10°. The change at the higher temp. is due to formation of the austenite-graphite eutectic and that at the lower to the austenite-Fe₃C eutectic.

CH. ABS. (e)

Alloys of iron. XII. The β_M transformation in manganese-rich iron-manganese alloys. M. L. V. GAYLER and C. WAINWRIGHT (Iron and Steel Inst., April, 1937, Advance copy, 5 pp.).—Experiments with 71% and 74% Mn-Fe alloys show that the β -Mn phase can exist in a metastable state at temp. < that at which the α β transformation occurs on heating. Discrepancies between published results (A., 1933, 1008; 1936, 1061) are thereby explained.

J. G. A. G.

Etching and microscopical investigation of phases in the copper-zinc system. J. L. RODDA (Amer. Inst. Min. Met. Eng. Tech. Publ. No. 746, 1936, 5 pp.).—The γ and ϵ phases are identified by anodic etching in 17% chromic acid. At c.d. >1.5 amp. per sq. cm. γ is attacked and ϵ unattacked. The reverse occurs at low c.d., and η is attacked under both conditions. The α and β phases are identified by their natural colours.

R. B. C.

Transformations in copper-aluminium eutectoid alloys. I. Intermediate stages in the hypereutectoid alloys. G. KURDJUMOV and T. STELLETKI (Tech. Phys. U.S.S.R., 1935, 2, 3—16).—Alloys with 10—15% Al were quenched from 600—950° and examined by the Debye-Scherrer method. With <13% Al the β phase changes to β' ; with >13% Al it changes to a γ phase, which decomposes in two steps. Decomp. starts at 300° and proceeds to a limit with formation of γ . The remaining γ

decomposes only on heating to 425—450°, forming $\alpha + \gamma$. On quenching hypereutectoid alloys (I) in a salt bath above 300°, some γ is pptd. from the β phase, the remainder of which is stable below 425°. On cooling (I) quickly below 300° the γ phase is not pptd., and the β phase changes to γ at 170—200°. The $\beta \rightarrow \gamma'$ transformation is irreversible and comparable with the austenite-martensite transformation in steels.

CH. ABS. (e)

Abnormal phenomena of cast copper-rich antimony-copper alloys during heating. Y. TANAKA and M. IIO (J. Chem. Soc. Japan, 1935, 56, 1293—1300).—With decrease of Sb the abnormal thermal expansion near 460° and 490° decreases. The limit of the solid solubility of Sb at 470° is 9.5—9.75%.

CH. ABS. (e)

Abnormal phenomena of cast copper-rich magnesium-copper alloys during heating. E. KOIZUMI and T. KAWAGUCHI (J. Chem. Soc. Japan, 1935, 56, 1300—1304).—The alloy with 0.8% Mg shows abnormal expansion near 550°.

CH. ABS. (e)

Ferromagnetic Curie points and the saturation of some nickel alloys. V. MARIAN (Ann. Physique, 1937, [xi], 7, 459—527).—A new apparatus for measuring Curie points at low temp. is described. For binary alloys of Ni with Cu, Zn, Al, Ti, Sn, V, Sb, Cr, Mo, Mn, Pd, Pt, and Au the Curie point is lowered as solute increases. The variation with composition, apart from the parabolic curve for Ni-Pd, is linear and this is also true for the variation with at. moment, except for Ni-Mn and Ni-Pd. The curves run approx. parallel. The alloys which correspond with a Curie point at 0° abs. and those which correspond with zero at. moment are in most cases identical; the slope of the at. moment curve \propto the no. of outer electrons in the added metal.

N. M. B.

Thermochemical effects in the formation of eutectoids of binary alloys. R. CHATELET (Compt. rend., 1937, 204, 1246—1248).—Thermochemical effects relating to the system Fe-C have been examined.

R. S. B.

Ternary system aluminium-magnesium-zinc. III. Section $Mg-Al_3Mg_4-Al_2Mg_3Zn_3-MgZn_3$ -Mg. W. KOSTER and W. DULLENKOFF (Z. Metallk., 1936, 28, 363—367; cf. this vol., 73).—This section contains five primary crystallites, viz., ϵ , δ , ζ , η , and a ternary compound (T), and shows three four-phase reactions: (a) liquid (Al 13, Mg 49%) + δ (Al 39, Mg 49%) \rightleftharpoons ϵ (Al 3.5, Mg 91%) + T (Al 20, Mg 27%) at 363°, (b) liquid + T (Al 18.5, Mg 26.5%) \rightleftharpoons ϵ + ζ at 342°, (c) liquid + η \rightleftharpoons T at 354°. The equilibria in the Mg-Al-Zn system are shown in a ternary diagram, a space model, and various sections through the latter.

A. R. P.

Chemical properties of metallic compounds. III. Aluminium-silicon solutions. J. A. KLJAT-SCHKO (J. Gen. Chem. Russ., 1937, 7, 492—498).—Silumins are shown to be equilibrium mixtures originating from the reversible reaction $Al + Si$ Al silicides.

R. T.

Relations between solid solutions formed by ferrous sulphide. A. MICHEL (Compt. rend., 1937,

204, 1066—1068; cf. this vol., 23).—Solid solutions of FeS with $>1\%$ of Te, Ti, or W are of the pyrrhotine type. Solutions of the FeS type, possessing higher ferromagnetism and a lower Curie point than FeS, are formed with Mn, Fe, Co, Ni, Cu, Zn, Ag, Cd, Sb, Pb, and Bi. The limiting solid solutions contain 3, 6, or 18 mols. of FeS per mol. of added element, according as the latter is uni-, bi-, or ter-valent, respectively. The two types of solid solution probably correspond with different arrangements of the S lattice.

A. J. E. W.

Experiment on a ternary system of liquids. A. A. VERNON and B. BROWN (J. Chem. Educ., 1937, 14, 143—144).—Equilibrium in the system PhNO_2 — AcOH — H_2O is described.

L. S. T.

Solubility of indium in mercury from 0° to 50° . W. G. PARKS and W. G. MORAN (J. Physical Chem., 1937, 41, 343—349).—The solubility can be represented by $-\log N = 53.57/T + 1.714$, where N is the wt. fraction of In in the saturated amalgam. The solubility suggests that In has an internal pressure approx. equiv. to that of Pb.

C. R. H.

Solid solubility of elements of sub-group Vb in copper. J. C. MERTZ and C. H. MATHEWSON (Amer. Inst. Min. Met. Eng. Tech. Publ. No. 747, 1936, 20 pp.).—Previous work on the solubilities of P, As, Sb, and Bi in Au is reviewed. New data derived from X-ray measurements are given for P, As, and Sb.

R. B. C.

Solubility of magnesium in the chlorides of magnesium, potassium, and sodium. A. I. SHURIN (Metallurg, 1935, 10, No. 4, 87—99).—Mg was heated in a steel bomb with MgCl_2 , $\text{MgCl}_2 + \text{NaCl}$, and $\text{MgCl}_2 + \text{KCl}$ at 800 — 1300° for 2.5 hr. and quenched, and the products were analysed. The solubility of Mg in MgCl_2 at 900° is 0.3%. It is much less in $\text{MgCl}_2 + \text{NaCl}$, and less still in $\text{MgCl}_2 + \text{KCl}$.

CH. ABS. (e)

Solubility of silver chloride in aqueous solutions of hydrochloric acid and alkaline chlorides. A. PINKUS and (MLLE.) A. M. TIMMERMANS (Bull. Soc. chim. Belg., 1937, 46, 46—73).—The form of the solubility curves for AgCl in LiCl and in HCl is similar to that previously found for NaCl and KCl (cf. this vol., 128). The min. solubilities, determined Tyndallographically, occur in 0.003 mol. solutions; the val. for NaCl and KCl is 3.63×10^{-7} , for LiCl 4.17×10^{-7} , and for HCl 4.47×10^{-7} mol. of AgCl per litre. The higher val. for the min. solubility in NaCl and KCl now obtained is attributed to part of the AgCl being in colloidal solution. In more conc. chloride solutions, where solubility is principally due to complex formation, the differences between the two sets of data diminish.

C. R. H.

Solubility of silver acetate in mixed solvents and the incomplete dissociation of ternary electrolytes. F. H. MACDOUGALL and W. D. LARSON (J. Physical Chem., 1937, 41, 417—429).—The solubility of AcOAg in aq. COMe_2 at 25° decreases with increase in $[\text{COMe}_2]$ between 10% and 20% COMe_2 . Nitrates increase the solubility, the effect being in the order $\text{KNO}_3 < \text{NaNO}_3 < \text{Sr}(\text{NO}_3)_2 < \text{Ca}(\text{NO}_3)_2$. The Debye-Hückel equation is valid up to high ionic strengths of KNO_3 and NaNO_3 , but the

increased solubility in presence of $\text{Sr}(\text{NO}_3)_2$ and $\text{Ca}(\text{NO}_3)_2$ is attributed to the incomplete ionisation of $\text{Sr}(\text{OAc})_2$ and $\text{Ca}(\text{OAc})_2$ with formation of AcOSr^+ and AcOCa^+ . The ionisation consts. for AcOSr^+ and AcOCa^+ calc. from the solubility data are respectively 0.34 and 0.15 in H_2O ; 0.12 and 0.094 in 10%, 0.087 and 0.058 in 20%, 0.037 and 0.019 in 30% COMe_2 . Equations are derived, based on Born's theory, which relate satisfactorily the equilibrium consts. to the dielectric consts. of the solvents.

C. R. H.

Solubilities of barium and strontium carbonates in aqueous solutions of alkali chlorides. R. W. TOWNLEY and W. B. WHITNEY [with W. A. FELSING] (J. Amer. Chem. Soc., 1937, 59, 631—633).—Solubility data at 25° and 40° for BaCO_3 and SrCO_3 in H_2O and aq. LiCl, NaCl, and KCl are recorded. The activity coeffs. of BaCO_3 and SrCO_3 in the chloride solutions and their average heats of dissolution in the saturated solutions have been calc.

E. S. H.

Acid salts of monobasic organic acids. III. J. D. M. ROSS, T. J. MORRISON, and C. JOHNSTONE (J.C.S., 1937, 608—614; cf. A., 1933, 1013; 1936, 937).—Solubility data relating to the mandelates at 25° are given for Li, Na, K, NH_4 , Rb, Cs, Tl, Mg, Ca, Sr, and Ba salts.

A. J. M.

Solubility of semicarbazones in dilute hydrochloric acid. F. B. LA FORGE and H. L. HALLER (J. Amer. Chem. Soc., 1937, 59, 760—761).—Semicarbazones can be divided into two groups, according to their solubility in dil. HCl. The sol. members include the semicarbazones of pyrethron, di- and tetra-hydropyrethron, and tetrahydropyretrolone; the insol. semicarbazones include those of pyrethrolone, pyrethrin, and hexahydropyretrolone. Their separation by solubility methods is discussed.

E. S. H.

Equation of solubility of hydrates. J. PERREU (Compt. rend., 1937, 204, 1037—1039).—The Le Chatelier equation is applicable to aq. solutions of NaCl and Na_2CO_3 . Thermal and v.p. data for solutions of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ confirm the authors' equation for the solubility of hydrates (A., 1934, 249).

A. J. E. W.

Dissociating power of chlorinated hydrocarbons. J. P. W. A. VAN BRAAM HOUCKGEEST (Chem. Weekblad, 1937, 34, 318—320).—The solubilities of NET_4I , NPr_4Br , and NPr_4I have been determined at 25° in $(\text{CH}_2\text{Cl})_2$, CHMeCl , $\text{CH}_2\text{Cl} \cdot \text{CHCl}_2$, CMeCl_3 , $(\text{CHCl}_2)_2$, $\text{CH}_2\text{Cl} \cdot \text{CCl}_3$, $\text{CHCl}_2 \cdot \text{CCl}_3$, Pr^sCl , Bu^sCl , and PhCl , and the significance of the results is discussed in relation to Walden's views on the influence of dipole moments, dielectric const., etc. on solubility.

S. C.

Partition of deuterium between methyl alcohol and water. G. OKAMOTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 211—216).—Only the H in the OH group of MeOH enters into an exchange reaction on shaking at 0° with a H_2 — D_2 mixture in presence of Pt-black. When the Me is combined with I the resulting MeI yields H_2O of normal d on combustion. Data for the above equilibrium, and for that between H_2O and D, at 20° , are recorded.

H. J. E.

Theory of the Freundlich adsorption isotherm. J. ZELDOVITSCH (Acta Physicochim. U.R.S.S., 1935, 1, 961—974).—A mathematical interpretation of deviations from the adsorption isotherm $q = Cp^{1/n}$ is discussed, and relations between temp. and the consts. C and n are derived. C. R. H.

Adsorption of gases by lead chloride spheres. F. DURAU and R. MÜLLER (Z. anorg. Chem., 1937, 232, 133—154).—Adsorption isotherms have been obtained for N_2 , C_2H_6 , CH_4 , C_2H_2 , N_2O , H_2 , and CO at 20° and for C_3H_8 at 20° , -15° , and -45° . Adsorption is small in all cases; for H_2 , N_2 , CO , and CH_4 it is hardly measurable. It is greatest with C_3H_8 , where 5.2% of the $PbCl_2$ surface (as determined by the radioactive method) is covered with a unimol. layer. E. S. H.

Heat of adsorption of gas by carbon at low temperature (-183°). R. LEPOINTE (J. Phys. Radium, 1936, [vii], 7, 469—472).—The large initial evolution of heat which accompanies the adsorption of H_2 by charcoal is due to the formation of an exothermic, stable surface-compound which is unaffected by heat but may be destroyed by saturation of the charcoal with O_2 (after a few experiments HNO_3 is required); other gases give a smaller evolution of heat which is approx. \propto the vol. of gas adsorbed. The modification of the surface in the formation of the compound does not affect the adsorbing power of the charcoal. F. J. L.

Kinetics of activated sorption of hydrogen on chromic oxide gel. L. CLARKE, L. S. KASSEL, and H. H. STORCH (J. Amer. Chem. Soc., 1937, 59, 736—740).—Theoretical. The data of Burwell and Taylor (A., 1936, 791) are analysed on the basis of a process involving primary adsorption followed by diffusion to secondary centres. A rate equation which fits the data for moderate amounts of sorption has been derived. E. S. H.

Rate of sorption of water vapour on silica gel and iron-silica gel. W. A. PATRICK and L. H. COHAN (J. Physical Chem., 1937, 41, 437—443).—Measurements have been made at 25° in absence and in presence of permanent gases. The rate of absorption on SiO_2 is independent of the permanent gas when the partial pressure of the latter is <0.5 mm. Hg. At higher partial pressures the rate of absorption is inversely \propto the pressure and to the mol. wt. of the permanent gas. Desorption data support the view that the inert gas resists the diffusion of H_2O vapour in the vapour phase around the gel, since the rate of desorption is independent of the gas present except when only the last traces of H_2O are present, in which case the rate is inversely \propto the pressure and to the mol. wt. of the gas. This latter effect is possibly due to gas trapped in the capillaries of the gel thereby hindering H_2O desorption. It is more noticeable with $Fe-SiO_2$ gel than with SiO_2 gel. C. R. H.

Adsorption of arsenic trioxide by various silica gels. M. S. CHARMANDARIAN and E. L. KAPELEVITSCH (J. Phys. Chem. Russ., 1936, 8, 929—932).—Adsorption by various samples of SiO_2 has been measured between 350° and 450° . J. J. B.

γ (A., I.)

Kinetic-radioactive investigations on the active surface of crystalline powders. L. IMRE (Trans. Faraday Soc., 1937, 33, 571—583; cf. this vol., 25).—The area of the active part of the surface of pptd. PbI_2 , $PbSO_4$, and $PbCrO_4$ has been calc. from determinations of the adsorption of $Pb(NO_3)_2$, and by measuring the rate of incorporation of $Th-B$. In those cases ($PbSO_4$ and $PbCrO_4$) where the adsorption was great enough to be directly measured the results obtained by the two methods agree. The radioactive method is specially adapted to fixing the limits of "real" (as distinct from exchange) adsorption. F. L. U.

Adsorptive properties of colloidal ferric oxide. E. I. RUDENKO and V. I. NIKOLAEV (Bull. Acad. Sci. U.R.S.S., 1936, 1045—1052).—Colloidal $Fe(OH)_3$ adsorbs all the solutes of natural salines, except Ca^{++} and Mg^{++} . The adsorbent-adsorbate complex does not yield FeS with H_2S . R. T.

Sorption of lime from solution by quartzites. S. L. GERMAN (J. Appl. Chem. Russ., 1936, 9, 2127—2133).—The sorption of $Ca(OH)_2$ by SiO_2 agrees with Freundlich's equation; the process is, however, supposed to involve chemical combination, since elution cannot be effected. R. T.

Sorption of lime from solution by quartzites. S. L. GERMAN (Ukrain. Chem. J., 1937, 12, 77—86).—The rate of adsorption of $Ca(OH)_2$ by SiO_2 varies with the structure and grain size of a given quartzite. R. T.

Asymmetric adsorption of complex salts on quartz. R. TSUCHIDA, M. KOBAYASHI, and A. NAKAMURA (J. Chem. Soc. Japan, 1935, 56, 1339—1345).—Asymmetric adsorption has been studied by immersion of finely powdered *d*- and *l*-quartz into racemic complex salt solutions. The *d*-quartz powder adsorbs *l*- $[Co en_3]Br$, *d*- $[Co en_2(NH_3)Cl]Br_2$, *d*- $[Co en_2Cl_2]Cl$, *d*- $[Co(C_2O_4)_3]K_3$, *d*- $[Co dg(NH_3)Cl]$, and *d*- $[Co\{Co(NH_3)_4(OH)_2\}_3]Cl$ (*dg* = dimethylglyoxime). CH. ABS. (e)

Adsorption of strong electrolytes by coppered charcoal. K. VOLKOV and D. STRASHESKO (Bull. Sci. Univ. Kiev, 1936, 2, 129—141).—The adsorptive capacity for H^+ rises with the Cu content (0—35%); adsorption of Cl^- from aq. $NaCl$ is at a max. for 5% Cu. The adsorptive capacity for OH^- is very low. R. T.

Sorption of deuterium oxide by cellulose. T. KING and C. OUELLET (Canad. J. Res., 1936, 14, B, 444—449).—The sorption of D_2O vapour by cellulose has been measured over the range -25° to 23.4° . The curves for D_2O and H_2O are closely similar, and at any given relative v.p. the ratio of the sorbed wts. of D_2O and H_2O is approx. \propto (mol. wt. D_2O)/(mol. wt. H_2O). A permanent increase (0.6—0.9%) in the wt. of the dry cellulose observed after desorption is attributed to an exchange reaction. F. L. U.

Adsorption of arsenic trioxide by clays. N. A. SCHIPINOV (Kolloid. Shurn., 1936, 2, 403—408).—Above 8—12 millimols. per litre the adsorption is negative. J. J. B.

Base-exchanging properties of synthetic aluminosilicate materials. J. R. PATTON and

J. B. FERGUSON (Canad. J. Res., 1937, 15, B, 103—112; cf. B., 1936, 986).—The base exchanges between Na^+ and Ca^{++} , and Na^+ and Ba^{++} , have been studied for Doucil gel at 9—21° using as anions Cl^- , OAc^- , and NO_3^- . The Ca content of the gel is less using OAc^- than with Cl^- and NO_3^- , and increases with temp. for conc. solutions. It is difficult to disentangle the influence of gel capacity and cation content from the results, which do not agree with the equation of Rothmund and Kornfeld (A., 1920, ii, 36). At const. anion normality $1/E$ (E — milliequivs. of entering cation in final gel) is a linear function of $1/P$ (P = equiv. % of cation in final solution). R. S. B.

Adsorption of amino-acids and other nitrogenous substances from aqueous extracts. H. FUCHS (Z. physiol. Chem., 1937, 246, 278—279).—It is shown that NH_2 -acids, sarcosine, taurine, creatinine, choline, and glycocyamine are effectively (>50%) adsorbed by "acid" adsorbents ("frankonite-KL" and Lloyd's reagent) from 0.01M solutions in 5 wt.-% H_2SO_4 . The absorption is > that by "neutral" adsorbents (e.g., fuller's earth). The adsorbed material is recovered by elution with saturated aq. $\text{Ba}(\text{OH})_2$. F. O. H.

Adsorption on foam. F. SCHÜTZ (Nature, 1937, 139, 629—630).—A technique for increasing the concn. of capillary-active substances is described. Cholic acid can be separated from its Na salt by this method. The foam has a temp. > that of the liquid from which it is produced, an effect which appears to be an essential condition for the formation of any foam. L. S. T.

Theory of surface tension of aqueous solutions of inorganic acids. K. ARIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 109—113).—The anomalous increase in γ of H_2O produced by addition of inorg. acids is quantitatively explained by H-bond formation at the surface. F. R. G.

Theory of surface tension of ternary solutions. K. ARIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 114—116).—The author's views (this vol., 76 and preceding abstract) are confirmed by vals. recorded by Belton (A., 1935, 1316; this vol., 76). F. R. G.

Rapid method for determining the lowering of tension of exposed water surfaces; surface tension of the sea and of inland waters. N. K. ADAM (Proc. Roy. Soc., 1937, B, 122, 134—139).—The behaviour of drops of a non-spreading heavy oil containing different amounts of a spreading substance ($\text{Me}[(\text{CH}_2)_{11}\text{OH}]$) has been examined. These solutions are calibrated by reference to solutions of known σ ; the accuracy is approx. 1 dyne per cm. For H_2O from the sea and rapidly flowing rivers σ is normal, except in and near harbours, sewage outfalls, etc., where it may be lower by 20 dynes per cm. F. A. A.

Surface tension of aqueous solutions of cyanamide and carbamide. A. WIADROWSKI (Przemysł Chem., 1936, 20, 245—246).—The σ of H_2O is lowered by both substances. R. T.

Surface tension of simple mixtures. V. K. SEMENTSCHENKO, A. F. GRATSHEVA, and E. A. DAVUIDOVSKAJA (Sotzial. Rekons. Nauk., 1935,

No. 5, 159—160).—In ternary mixtures the surface tension at 0—80° does not depend on the concn. of any one component, and cannot, therefore, serve to show the presence of a particular component. CH. ABS. (e)

Influence of surface impurities on measurements of the interfacial tension. E. VELLINGER and A. GRÉGOIRE (Bull. Soc. chim., 1937, [v], 4, 716—717).—Data are recorded for the interfacial tension between a pure hydrocarbon oil layer and a H_2O layer contaminated with mineral oil, and having a surface tension of 55—73 dynes per cm. H. J. E.

Electric charge at an oil-water interface. W. C. M. LEWIS (Trans. Faraday Soc., 1937, 33, 708—713).—The max. charge density at the interface H_2O -org. liquid is calc. on the assumption that the energy of the condenser formed by the Helmholtz double layer can be measured by the adhesional work at the interface. The vals. so obtained ($4\text{—}6 \times 10^4$ c.s.u. per sq. cm.) lead to a reasonable val. for the capacity of the double layer, in approx. agreement with that furnished by electrocapillary data for a Hg-aq. electrolyte interface. F. L. U.

Interfacial tensions of some mercury-hydrocarbon oil systems. J. L. CULBERTSON and F. A. HEDMAN (J. Physical Chem., 1937, 41, 485—491).—The interfacial tensions, γ , between Hg and refined white oils between 25° and 125° decrease approx. linearly with rise of temp. Unrefined motor oils show at first a sharp decrease in γ with rise of temp., then a temp. range of almost const. γ , followed by a further decrease in γ . The presence of adsorbable components in the unrefined oils is considered to afford an explanation of their behaviour. C. R. H.

Effects of traces of metallic ions on films at interfaces and on the surface of water. R. J. MYERS and W. D. HARKINS (Nature, 1937, 139, 367—368).—Traces of Ca, Cu, and Zn affect considerably the properties of surface films, and, apart from experiments in a strongly acid solution, previous results reported are probably vitiated by such contamination. Quartz or very heavily paraffined glass troughs and very pure salts should be used in all future work. L. S. T.

Relations between surface p_H , ion concentrations, and interfacial tension. J. F. DANIELLI (Proc. Roy. Soc., 1937, B, 122, 155—174).—Data are given for the influence of p_H on the lowering, by long-chain fatty acids, of the interfacial tension, γ , at the $\text{PhBr-H}_2\text{O}$ interface; with increase of p_H , γ is lowered. Dilution of the buffer solutions with H_2O displaces the curves along the p_H axis; dilution with neutral salt solutions (cation concn. kept const.) produces little or no effect. Ca^{++} added to alkaline solutions produces marked rises in γ . From the results it is calc. that the p_H at an interface may differ by +2 p_H units from that of the bulk aq. phase (e.g., physiological salt solutions). F. A. A.

Validity of Traube's rule for liquid-liquid interface. S. BOAS-TRAUBE and M. VOLMER (Z. physikal. Chem., 1937, 178, 323—335).—The rule is valid for the surface activity of the first six members

of the fatty acid series at a $C_6H_6-H_2O$ interface. Application of Szyszkowski's surface tension equation shows that the space occupied by fatty acid mols. at this interface is only from one third to a half of that occupied at an air- H_2O interface. At the interface and in the aq. phase the acids are present as single mols., but in C_6H_6 the higher members are present as double mols. R. C.

Spreading of liquids on filter-paper. I. K. PROSAD and B. N. GHOSH (Kolloid-Z., 1937, 79, 19—29; cf. A., 1934, 840).—The formula previously deduced for the rate of spreading of single drops has been confirmed by measurements on 21 liquids. The consts. in the formula appear to be systematically related to the chain length of unbranched aliphatic compounds, but in other cases depend also on structure. F. L. U.

Effects of traces of metallic ions on monolayers. J. S. MITCHELL, E. K. RIDEAL, and J. H. SCHULMAN (Nature, 1937, 139, 625—626; cf. this vol., 300).—Traces of metallic impurities, especially of Cu or Ni, can play a predominating part in chemical reactions occurring in unimol. films. The electrical potential at phase boundaries may also be affected. Examples are quoted in illustration of these effects, which are probably of great biological significance. L. S. T.

Effects of traces of metallic ions on monolayers. C. ROBINSON (Nature, 1937, 139, 626; cf. preceding abstract).—The interfacial tension between oil and H_2O in presence of the Na salts of long-chain acids is markedly lowered by traces of metallic ions present as impurities in distilled H_2O . The effect of salts in lowering the interfacial tension of oil depends primarily on the valency of the cation. L. S. T.

Unimolecular layers. I. Use of an electro-metric valve for the measurement of variations in the air-liquid contact potential. D. G. DERVICHIAN and C. O'CEALLAIGH. II. Direct registration of the electric effect of unimolecular layers. D. G. DERVICHIAN (J. Phys. Radium, 1935, [vii], 6, 427—428, 429—432).—I. Rapid registration of variations in contact potential can be obtained by the use of a valve electrometer.

II. The surface tension and contact potential of the film are registered simultaneously. O. D. S.

Oxide films on copper and iron. U. R. EVANS and H. A. MILEY (Nature, 1937, 139, 283).—New electrical measurements of the thickness of oxide films responsible for interference colours on Cu and Fe show good agreement with vals. obtained optically, and in the case of Fe by gravimetric methods also. The rapid growth of invisible oxide on Cu in a desiccator at 18° or in a furnace at 62° has been measured by the electrical method. L. S. T.

Thickness of oxide films on iron. H. A. MILEY (Iron & Steel Inst. Carnegie Schol. Mem., 1936, 25, 197—212).—New vals. have been obtained for the thickness of the oxide films responsible for the interference colours on Fe, by measuring the millicoulombs needed for their cathodic reduction. The method has been used to measure the O_2 uptake at room temp. Vernon's observation that no bright colours

appear on Fe below 200° is confirmed. It is believed that the oxide formed below 200° is $\gamma\text{-Fe}_2O_3$ (cubic), whilst that formed above 200° is $\alpha\text{-Fe}_2O_3$ (hexagonal); if the $\gamma\text{-Fe}_2O_3$ is in optical continuity with the Fe base (cubic), it will afford no adequate lower reflecting surface, whereas if the $\alpha\text{-Fe}_2O_3$ is crystallographically discontinuous with the base, it will provide the conditions necessary for interference. A. J. K.

Photo-electric Schottky effect in films of sodium and potassium on tungsten. R. C. L. BOSWORTH (Trans. Faraday Soc., 1937, 33, 590—596; cf. A., 1936, 793).—The surface diffusion properties of films of K and Na on W have been examined in the light of Langmuir's patch theory of the Schottky effect. For K films, whether dil. or conc., formed by condensation, the variation of the photo-electric emission under white light is in accordance with the Schottky theory, whilst for dil. films formed by evaporation the variation is far greater and indicates heterogeneity of the film. Dil. Na films give a Schottky coeff. of 2—3 times the normal val. calc. from the image field of an electron escaping from the surface. F. L. U.

Elasticity of thin films in relation to cell surface. E. N. HARVEY and J. F. DANIELLI (J. Cell. Comp. Physiol., 1936, 8, 31—36).—Measurements of γ and elasticity made on bubbles of soap, lecithin, egg-white, and various mixtures of these show that only films containing protein have elastic properties. M. A. B.

Influence of surface layers of insoluble substances on the velocity of evaporation of water. M. BARANAEV (J. Phys. Chem. Russ., 1937, 9, 69—76).—The velocity of evaporation of H_2O has been measured in the presence of monolayers of lauric, palmitic, stearic, and oleic acids, of palmitonitrile, hexadecyl acetate, and cetyl alcohol. For "condensed" layers $\log w_0/\log w = \text{const.} \times \sigma/T$ (w_0 is velocity of evaporation of pure H_2O , w that of H_2O in presence of a monolayer corresponding with the surface tension σ). The largest effect is shown by cetyl alcohol ($w_0/w = 1820$) and the effect of "stretched" monolayers is much smaller than that of "condensed" layers. A formula is derived on the assumption that evaporation takes place through "holes" in the monolayers. E. R.

Physical properties of chlorophyll films. E. A. HANSON (Proc. K. Acad. Wetensch. Amsterdam, 1937, 40, 281—285).—The smallest area of the chlorophyll- $a + b$ mol. occurring in films on solutions of p_H 4.4 is 106 Å., indicating that the coloured nucleus may be a plane structure. This is supported by the strong X-ray refraction line corresponding with a period of 4.2 Å. Owing to hydration, the mol. surface area increases from 106 to 123 Å.² when the p_H increases from 4.4 to 8.5. At high p_H vals., mol. area-pressure curves indicate that dehydration by pressure occurs discontinuously. Below p_H 4.4 the Mg is replaced by H, forming phaeophytin, which has a larger surface and a higher tolerated pressure than chlorophyll at p_H 4.4. J. W. S.

Phosphatide auto-complex coacervates as ionic systems and their relation to the protoplasmic

membrane. II. H. G. B. DE JONG and G. G. P. SAUBERT (Proc. K. Acad. Wetensch. Amsterdam, 1937, 40, 295—301; cf. A., 1935, 1321).—The previously postulated interactions between hydrocarbon chains of fatty acids and sensitizer mols. have been confirmed experimentally. The double film conception is extended to embrace zwitterion-cation-anion double films (this vol., 39) which account for the condensing action of suitable bivalent cations, e.g., Ca^{++} . J. W. S.

Optical contact. (LORD) RAYLEIGH (Proc. Roy. Inst., 1937, 29, 432—440).—A lecture.

Interpretation of osmosis and osmotic pressure. A. THIEL (Z. physikal. Chem., 1937, 178, 374—388).—The bombardment theory of osmotic pressure, P , is rejected. The usual equation connecting P and v.p. depression can be derived by regarding P as a suction which must be applied to the solvent to reduce its v.p. to that of the solution, and prevent osmosis. It is impossible for any non-volatile solute to exert a thermal pressure on a semipermeable membrane. The properties of such membranes are best explained by supposing that the solvent passes through in the mol. dispersed state. R. C.

Osmotic anomalies in the system water-ethyl acetate-salt. N. V. SAPOSHNIKOVA and S. G. LINETZKAJA (J. Phys. Chem. Russ., 1936, 8, 943—952).—From f.p. data for aq. solutions of $\text{EtOAc} + \text{KCl}$, NaCl , Na_2SO_4 , MgCl_2 , MgSO_4 , and BaCl_2 average ionic radii have been calc. J. J. B.

Dependence of osmotic pressure in solutions of high-molecular substances on concentration. O. KRATKY and A. MUSIL (Österr. Chem.-Ztg., 1937, 40, 144—147).—The rapid increase of the relative osmotic pressure P/c with c in dil. solutions of high mol. wt. substances with thread-like mols. is explicable without recourse to supplementary osmotic effects or to large solvent envelopes, if the expression for P contains a term or terms representing the interaction of solute and solvent mols., such interaction being assumed \propto the total chain length rather than to the no. of macromols. Using an expression formally analogous to that of Ostwald (A., 1932, 570) the theory is developed in a semiquant. manner. F. L. U.

Constants of ebullioscopy. C. S. HOYT and C. K. FINK (J. Physical Chem., 1937, 41, 453—456).—Ebullioscopic consts., K_b , for 18 solvents calc. on the basis of Rosanoff and Dunphy's equation agree with vals. calc. from the usual thermodynamic equation, provided the gas const. in the latter is corr. by the Berthelot equation. The average decrease in the val. of K_b for each 1 mm. decrease in atm. pressure is 0.025. C. R. H.

Density and molecular volume in solution. I. Method of density measurement and the molecular volume of dissolved carbamide. O. K. SKARRE, S. G. DEMIDENKO, and A. E. BRODSKI (Acta Physicochim. U.R.S.S., 1937, 6, 297—305).—A differential pycnometric method is described which permits d to be measured to $\pm 1 \times 10^{-6}$. d^{25} has been determined for KCl and for $\text{CO}(\text{NH}_2)_2$ solutions.

The difference in variation of mol. vol. with concn. for these two compounds is in accord with theory. J. W. S.

Partial molar volume of water and deuterium oxide in dioxan solution. R. A. ROBINSON and R. P. BELL (Trans. Faraday Soc., 1937, 33, 660—652).—In view of the possibility that the observed relation of the mol. vols. of liquid D_2O and H_2O ($\text{D}_2\text{O} > \text{H}_2\text{O}$) may be due to the pseudo-cryst. structure of H_2O , the apparent mol. vol. (ϕ) of each compound dissolved in dioxan, in which such effects would be eliminated, has been determined. Over a range up to 17 mol.-% the ϕ of D_2O is about 0.5% < that of H_2O , in agreement with theory. F. L. U.

Diamagnetism of solutions of iodine. C. COURTY (Compt. rend., 1937, 204, 1248—1250).—The magnetic susceptibility of I has been examined in 1—20% solutions of I in Et_2O , CS_2 , PhMe , CHCl_3 , CCl_4 , and C_6H_6 . Deviations from additivity are greatest for the red and red-brown, and least for the violet, solutions. R. S. B.

Individuality of osmotic behaviour of alkali carbonates. F. ENDER (Z. Elektrochem., 1937, 43, 234—238).—The mol. f.p. depression and osmotic coeff. of K_2CO_3 are > those of Na_2CO_3 over the whole concn. range. The parallelism between osmotic coeff., solubility, and heat of dissolution is discussed in relation to the hydrophilic properties of the dissolved ions. E. S. H.

Abnormal vapour pressures in potassium chloride solutions. H. N. PARTON (Trans. Faraday Soc., 1937, 33, 617—623).—V.p. data obtained (1) by calculation from the measured activities of KCl , (2) directly, and (3) by Hill's thermopile method are shown to be consistent, and afford no evidence of the abnormalities reported by Weir (A., 1936, 678). F. L. U.

X-Ray diffraction and electrolytic dissociation. I. Sulphuric acid and sulphates. R. S. KRISHNAN (Proc. Indian Acad. Sci., 1936, 4, A, 661—666).—Pure H_2SO_4 gives only one sharp intense X-ray diffraction max., with very little scattering on either side. On dilution with H_2O the ring becomes broader and more diffuse until 50% H_2SO_4 gives only a bright corona surrounding the central spot, the edge of the corona corresponding with the outer edge of the H_2O -ring. With further dilution, the halo again appears, and in very dil. solutions its max. coincides with that of H_2O . 34% aq. KHSO_4 shows the same pattern as 30% H_2SO_4 , whilst 10% aq. KHSO_4 or 20% aq. K_2SO_4 or Li_2SO_4 gives patterns similar to those of very dil. H_2SO_4 . The results are explained on the basis of the two-stage dissociation of H_2SO_4 in H_2O , observed in Raman spectra. J. W. S.

Viscosity and plasticity of disperse systems. I. M. P. VOLAROVITSCH (Kolloid. Shurn., 1936, 2, 557—560).—Vals. are recorded for clay, dough, peat, soap, and printing-ink. J. J. B.

Pyrosols. E. HEYMANN (J. Proc. Austral. Chem. Inst., 1937, 4, 38—51).—A lecture (cf. A., 1930, 286, 992; 1935, 1063). F. L. U.

Synthesis of hydrosols of sparingly soluble salts by electrolysis. Hydrosols of copper arsenate and copper arsenite. B. ZAPROMETOV and Z. KAMSOLOVA (Kolloid. Shurn., 1936, 2, 577—588).—The sols have been prepared by electrolysis of 0.005N- Na_3AsO_4 or Na_3AsO_3 with a Cu anode at 80°. They are negative. Positive Cu arsenate sols are formed when Cu salts are electrolysed with a $\text{Zn}_3(\text{AsO}_4)_2$ cathode. All the sols may be used as insecticides for plants. J. J. B.

Heterogeneous chemical reactions under the silent electric discharge. XV. Preparation of colloidal solutions. IV. S. MIYAMOTO (J. Chem. Soc. Japan, 1935, 56, 1359—1364).—Hydrosols and alcosols of Cu_2O were prepared from CuSO_4 by the action of at. H produced by a silent electric discharge. Hydrosols and alcosols of CuS (from CuS), hydrosols of Hg (from HgNO_3) and of HgS [from HgS and from $\text{Hg}(\text{CNS})_2$] were prepared similarly.

CH. ABS. (e)

Colloidal state induced by the action of zinc on natural waters. L. BOUCHET (Compt. rend., 1937, 204, 1068).—Blue colloidal solutions are obtained by prolonged immersion of pure Zn in the H_2O .

A. J. E. W.

Distribution of concentration of colloids in sedimentation equilibrium produced by ultracentrifuging. T. KATSURAI (Kolloid-Z., 1937, 79, 30—31; cf. A., 1936, 680).—An alternative derivation of the formula resulting from the solution of Lamm's differential equation is given. The experimental data for *R*-phycoerythrin fall on a curve similar to that calc. by the formula. F. L. U.

Measurement of the dispersion of aerosols. N. FUCHS (Acta Physicochim. U.R.S.S., 1937, 6, 143—160).—The various methods of measuring the sizes of particles in aerosols are described and critically compared. J. W. S.

Electrochemical properties of palmitic acid hydrosols. S. MUKHERJEE (J. Indian Chem. Soc., 1937, 14, 17—36).—The p_H of palmitic acid sol varies irregularly, but tends in all cases to 5.0 with time. The total acidity found by electrometric or conductometric titration varies with the base used, in the order $\text{Ca}(\text{OH})_2, \text{Ba}(\text{OH})_2 > \text{NaOH} > \text{NH}_3$. The phenomena accord with the view that the sol is a two-phase system, the differences in behaviour towards different bases being dependent on the solubility, degree of hydrolysis, and adsorption of the salts formed. J. S. A.

Viscosity-concentration relations of colloidal solutions. I. Critical valuation of viscosity-concentration formulæ. II. Classification of colloids according to shape of particles. H. L. BREDÉE and J. DE BOOYS (Kolloid-Z., 1937, 79, 31—43, 43—49; cf. A., 1933, 460).—I. A no. of η -concn. formulæ are discussed, the majority of which are formally reducible, for dil. sols, to Einstein's expression, but with different material consts. Three of the formulæ examined reproduce satisfactorily the η -concn. curves for several natural polymerides, but not for synthetic resins. More than one const. is needed in order to include substances

yielding particles of markedly anisodimensional shape. Four recent formulæ of this type are discussed.

II. Two empirical two-const. formulæ are proposed, in which the material const. is modified by a correction factor containing a second const. relating to the spatial extension of the particles. The correction term vanishes for spherical particles, and its magnitude increases with increasing chain length for substances such as $\text{PhOH-CH}_2\text{O}$ resins and polystyrenes. Within certain limits evaluation of the extension const. enables a distinction to be drawn between micellar and molecularly dispersed colloids. Examples are given. F. L. U.

Electric properties of colloidal silicic acid. KORGIN *et al.* (Sotzial. Rekons. Nauk., 1935, No. 5, 112).—Neutral H_2SiO_3 sols, prepared by hydrolysis of SiCl_4 and by oxidation of SiH_4 with O_3 in H_2O , have no appreciable charge. The acidity is due to traces of strong acids. On mixing aq. Ca salts with colloidal H_2SiO_3 , adsorption compounds are formed.

CH. ABS. (e)

Comparative electrochemical studies of highly purified lyophilic sols. I. Gum arabic sol. II. Silicic acid sol. W. PAULI and L. PALMRICH (Kolloid-Z., 1937, 79, 63—69, 69—77; cf. A., 1933, 349; 1926, 574).—I. Gum arabic (I) sol, purified by electrodialysis and electrodecantation, has been used for measurements of conductivity, H^+ activity, and conductometric titrations with NaOH and $\text{Ba}(\text{OH})_2$. The equiv. wt. calc. from the titration agrees with that deduced from the wt. of Ag_2O which can combine with the acid, and supports the chemical evidence that (I) consists of five hexose units linked to an aldobionic acid. The dissociation const. of (I) increases with concn. and tends to a limit about 1.5×10^{-3} . Possible causes of this are discussed.

II. Similar measurements have been carried out with ten different silicic acid (II) sols. The calc. mean dissociation const. is $4-5 \times 10^{-7}$. The colloidal complex is considered to be stabilised by a metasilicic acid which, in consequence of the small second dissociation const., functions as a monobasic acid. With this assumption, the colloid equiv. = 4000 approx. Addition of KCl increases $[\text{H}^+]$, but causes the conductivity to be $<$ that calc. additively. The conductivity increases linearly and reversibly with temp. F. L. U.

Stability of emulsions. H. M. CASSEL (Acta Physicochim. U.R.S.S., 1937, 6, 289—296).—A criterion of the stability of emulsified films is deduced thermodynamically, and it is shown that the region of stability of films of given curvature is determined by the course of the adsorption isotherm. The theory is in accord with existing data on emulsions. It also explains qualitatively the action of protective colloids. J. W. S.

Optical method of determining the relative coagulating powers of electrolytes. C. V. JOGARAO (Proc. Indian Acad. Sci., 1937, 5, A, 193—199).—The coagulation of As_2S_3 sols has been followed by measuring the depolarisation factor for horizontally polarised light (indicating the size of the particles), and for vertically polarised light (showing the devi-

ation from sphericity). The coagulating powers correspond with the series: $\text{HCl} > \text{NH}_4\text{Cl} > \text{KCl} > \text{NaCl}$; $\text{CaCl}_2 > \text{SrCl}_2 > \text{BaCl}_2$; $\text{FeCl}_3 > \text{AlCl}_3$. The As_2S_3 particles remain approx. spherical throughout the coagulation, and their final size is \propto the valency of the coagulating ion. R. C. M.

Coagulation of acetylcellulose sols. V. A. KARGIN and A. A. STEPANOVA (*Acta Physicochim. U.R.S.S.*, 1937, 6, 183—194).—The changes in viscosity, osmotic pressure, and turbidity of cellulose acetate sols during coagulation have been measured. Addition of gel to the sols greatly accelerates the coagulation. The velocity of coagulation is not greatly influenced by temp. J. W. S.

Influence of gelatin on the stability of silver bromide sols. K. S. AMELINA (*J. Phys. Chem. Russ.*, 1937, 9, 100—111).—Cataphoretic velocities and optical densities were measured at various concns. of gelatin (0—0.4%) and varying p_H (2.8—6.9). At lower concns. the stabilisation is due to the gelatin communicating its charge to the sol; at higher concns. (>0.005%) the absorption of gelatin by the sol particles converts the lyophobic sol into a lyophilic sol. Adsorption is complete at 0.005—0.01% gelatin; further increase in concn. does not affect the cataphoretic velocity, which is equal to that of gelatin itself. The isoelectric point of gelatin is not affected by the presence of AgBr . E. R.

Kinetics of aerosol coagulation by the diffusion method. L. V. RADUSHEVITSCH (*Acta Physicochim. U.R.S.S.*, 1937, 6, 161—182).—The deposition of particles from NH_4Cl aerosols flowing through vertical glass capillary tubes has been investigated, the results indicating that as the sol passes through the capillary it diffuses towards the walls in accordance with Townsend's theory for the diffusion of gaseous ions. They also indicate that Smoluchowski's theory of coagulation applies to smokes obtained by volatilisation in an air stream which are homogeneous in the early stages. J. W. S.

Dispersion of calcium soaps by fatty compounds with [capillary]-active anions. A. LOTTERMOSE and H. FLAMMER (*Kolloid-Beih.*, 1937, 45, 359—412).—A new method of determining relative dispersing power is described. The capacity for dispersing Ca laurate, stearate, and oleate has been studied for Na alkyl sulphates (C_{12} , C_{14} , C_{16} , and C_{18}), Na oleate, and Igepon-T. Curves are given to show the amount of Ca remaining on cotton material treated under standard conditions with varying concns. of the dispersing agent. Of the alkyl sulphates C_{12} is the most effective for Ca laurate, and C_{14} for the stearate and oleate. Na oleate is of the same order of effectiveness for all the Ca soaps, whilst Igepon-T is superior to the others in every case. Potential measurements in mixtures of Ca soaps and dispersing agents show that with increasing concn. of the latter the p_H increases towards a limiting val. The effect is attributed both to hydrolytic adsorption, the mechanism of which is discussed, and to hydrolysis of molecularly dispersed Ca soap. Washing tests with the same mixtures show that part of the detergent action is

due to the Ca soap, and that parallelism exists between washing power and increase of $[\text{OH}^-]$. From the results obtained the composition of soaps and dispersing agents suitable for waters of varying hardness is deduced. F. L. U.

[Study of] peptisation of hydrated oxides by conductometric titration. A. LOTTERMOSE and R. SCHMIED (*Kolloid-Beih.*, 1937, 45, 211—252).—The possible mechanism of peptisation of hydrated oxides of Al, Fe, and Cr through the formation of complex hydroxo-salts is discussed in the light of Werner's theory. Results of conductometric titration of AlCl_3 , $\text{Al}(\text{NO}_3)_3$, $\text{Al}(\text{ClO}_4)_3$, $\text{Al}_2(\text{SO}_4)_3$, hexa-, penta-, and tetra-aquo-Cr chlorides, hexa-aquo-Cr nitrate and sulphate, and $\text{Fe}(\text{NO}_3)_3$ with NaOH are given, and supplemented by back titration of the solutions with the corresponding acids. In the Al and Cr salts internal hydrolysis occurs at room temp., but the evidence in the case of Fe is inconclusive. Basic salts are formed during the early stages of peptisation of $\text{Al}(\text{OH})_3$ and $\text{Cr}(\text{OH})_3$.

Sensitising effect of small amounts of alkali on silicic acid sol. V. N. KRESTINSKAJA and N. E. NATANSON (*Kolloid. Shurn.*, 1936, 9, 599—607).—Mixtures of SiO_2 sol and NaOH have been titrated potentiometrically. In explanation of the sensitising effect (cf. Freundlich and Cohn, A., 1926, 677) it is suggested that small amounts of NaOH produce a lyophobic polymeride of SiO_2 , whilst with higher $[\text{NaOH}]$ lyophilic Na_2SiO_3 is formed. J. J. B.

Physico-chemical properties of araban. T. K. GAPONENKOV (*Kolloid. Shurn.*, 1936, 2, 561—575).—An improved prep. of araban (I) from hydratopectin is described. Vals. are recorded for the osmotic pressure, d , n , and η of aq. solutions of (I). The conductivity and $[\text{H}^+]$ of mixtures of (I) and electrolytes show that (I) binds alkali. The Ca derivative of (I) may be pptd. by EtOH; its aq. solution is scarcely affected by CO_2 . J. J. B.

Influence of salts on viscosity of gelatin solutions and rôle of the activity coefficient. W. OSTWALD and W. W. STUART (*Kolloid-Z.*, 1937, 79, 49—55).—Curves representing respectively the variation of the relative η of a gelatin sol and the activity coeff. of the anion (f') with salt concn. are similar in shape and relative position for NaCl, Na_2SO_4 , and $\text{Na}_4\text{Fe}(\text{CN})_6$. Using exact data for the η of 1.4% gelatin sol at p_H 4.7 (this vol., 240), a linear relation is found between η and f' for KCl up to 0.75*N*. With more dil. sols the lines exhibit curvature at low salt concns. F. L. U.

Dependence of the rate of gelatinisation of gelatin of various ages on the concentration and the frequency of melting. I. BULANKIN and S. TVERDUN (*Kolloid. Shurn.*, 1936, 2, 533—537).—The rate of gelatinisation decreases during the process of ageing. The ageing is less rapid in highly conc. solutions; it is accelerated by frequent meltings and gelatinisations. J. J. B.

Gelatinisation of proteins by bases. W. KOPACZEWSKI (*Kolloid-Z.*, 1937, 79, 102—103; cf.

A., 1935, 374).—Comments on papers by Donnelly (A., 1935, 1320; this vol., 81). F. L. U.

Recent advances in the electrochemistry of the proteins. E. J. COHN (Trans. Electrochem. Soc., 1937, 71, Preprint 24, 269—275).—A discussion of the dielectric and other electrochemical properties of certain proteins. J. W. C.

Pectin as protective colloid. E. SAUER and K. SANZENBACHER (Kolloid-Z., 1937, 79, 55—63).—Data are given for the influence of heat, ageing, acids, alkalis, and neutral salts on the η of solutions of citrus and apple pectin. Sols of Cu and Ag prepared by reduction with N_2H_4 are stabilised by 0.01—0.2% of pectin. The protective action is not diminished by partial degradation of the pectin. F. L. U.

Free and bound water in the proteins of wheat and their dependence on p_H . V. I. UTOTSCHKIN (Kolloid. Shurn., 1936, 2, 399—401).—The negative adsorption of sucrose from H_2O by gluten has been measured between p_H 1.95 and 9.28. It is max. at 4. J. J. B.

Electrophoretic analysis of colloidal mixtures. A. TISELIUS (Trans. Faraday Soc., 1937, 33, 524—531).—Apparatus suitable for the separation of colloidal solutes of different mobilities is described; the principal feature of this is the interposition of large vols. between the reversible electrodes and the moving boundaries. Disturbances due to thermal convection are examined in detail, and it is shown that the permissible potential gradient may be increased tenfold by using tubing of flat section and operating at about 4°. The apparatus is specially useful in separating proteins, suitable mobilities being secured by adjustment of the p_H . F. L. U.

Electrokinetic study of lyophilic properties of cellulose derivatives. I. Swelling and ζ -potential of cellulose nitrate in organic liquids. K. KANAMARU and S. UENO (Kolloid-Z., 1937, 79, 77—91).—The liquids used were $EtOH$, Et_2O , $COMe_2$, $EtOAc$, and C_6H_6 . Cellulose nitrate with N 13.5%, immediately after immersion, exhibits a ζ -potential which is the higher the greater is the degree of swelling. The ζ -potential falls, rapidly at first, to a min., rises more slowly to a max., and finally approaches a const. val. asymptotically. The rate of the initial fall is the greater, the greater is the degree of swelling. The observations are discussed theoretically. F. L. U.

Electrophoretic mobility of purified tristearin. II. Alkaline region. A. L. ROBERTS (Trans. Faraday Soc., 1937, 33, 643—650; cf. this vol., 79).—Mobilities in solutions of Na salts, determined in the region p_H 7—12, show a gradual rise with increase of p_H , and are not affected by the exchange of Cl' for borate ions. The curves for salt-free dispersions and those containing different concns. of Na salts are approx. parallel, the mobilities decreasing with increasing $[Na']$. Ba'' has a more strongly depressing effect than Na' , whilst OH' is unique in its influence on the mobility. F. L. U.

Electrokinetic potential of natural calcium carbonates. V. M. GORTIKOV and N. P. MALINOV-

SKAJA (Kolloid. Shurn., 1936, 2, 429—433; cf. this vol., 152).—Calcite, aragonite, marble, etc. are positive; corals, chalks, and tuffs are negative.

J. J. B.

Relation between the lyotropic series and free energies. L. H. N. COOPER (Nature, 1937, 139, 284—285).—The order of the anions in the Hofmeister series is closely parallel with that of the Gibbsian standard free energies of formation from their elements. The free energies of formation of the halide ions \propto their standard electrode potentials, and hence for these ions the lyotropic series may be determined by the readiness of electron transfer. L. S. T.

Crystal transfer mechanism. II. Iodine-iodide crystal exchange reactions in silica gel. M. A. MILLER (J. Physical Chem., 1937, 41, 375—378).—Sols prepared with equal quantities of water-glass (d 1.06) and N -AcOH, and containing 0.1N-KI, were, after solidification, separately covered with 0.5N-HgCl₂, 0.5N-Pb(OAc)₂, and saturated Br-H₂O, and the formation and movement of cryst. I, PbI₂, and HgI₂ were observed. Replacements brought about by covering gels containing PbI₂ or HgI₂ with Br-H₂O or by covering those containing I with 0.5N-Hg(NO₃)₂ or -HgCl₂ were also observed. In some cases crystals composed of two materials, e.g., I and HgI₂, were obtained, and under certain diffusion conditions single-crystal pseudomorphs of rhombic HgI, and tetragonal I were possible. C. R. H.

Mathematical expression of the process of swelling of soluble and insoluble colloids. G. I. ROMASCHEV (Kolloid. Shurn., 1936, 2, 443—460).—Changes of vol. during swelling are calc. J. J. B.

Potentiometric and conductometric analysis of the processes of coagulation and sign reversal of iron hydroxide sol by sodium citrate. A. M. WEINTRAUB (Kolloid. Shurn., 1936, 2, 479—485).—Additions of Na citrate alter both the electrokinetic potential of $Fe(OH)_3$ particles and the potential of a bright Pt electrode in the sol in an analogous manner. J. J. B.

Separation in crystalloidal neutral salt solutions, analogous to complex coacervation of biocolloid sols. H. G. B. DE JONG and K. C. WINKLER (Z. anorg. Chem., 1937, 232, 119—132).—Separation of a liquid phase occurs when solutions of hexol nitrate and $K_3Co(CN)_6$ within certain concn. ranges are mixed. The droplets are subject to electrophoresis in a direction which depends on which reagent is in excess. The concn. relations and the influence of neutral salts resemble the effects observed in the coacervation of colloid systems. E. S. H.

Causes of deviations from the fundamental law of the wave theory. V. K. NIKIFOROV and A. P. RUNTZO (Kolloid. Shurn., 1936, 2, 461—465).—The distance between adjacent rings in the periodic reactions between KI and $Pb(NO_3)_2$ rises with the temp. (0—80°). At high temp. it corresponds with the wave theory. At low temp. the calc. mol. wt. of the diffusing electrolyte appears too large, presumably owing to hydration. J. J. B.

Laws of gas mixtures. P. GLANSDORFF (J. Chim. phys., 1937, **34**, 96—108).—Equations for the thermodynamic properties of gas mixtures have been derived by methods similar to those used by Gibbs.

R. C.

Thermodynamics of infinitely dilute solutions in mixed solvents. I. Henry's coefficient for mixed solvents which are ideal solutions. I. R. KRITSCHESKI (J. Phys. Chem. Russ., 1937, **9**, 41—47).—Assuming that the partial mol. vol. of the solute in an ideal mixed solvent is a linear function of the composition of the solvent, the following formula is derived: $\log k = N_1 \log k_1 + N_2 \log k_2$ (k = Henry's coeff. for a mixed solvent containing N_1 mols. of a component with the coeff. k_1 , and N_2 of a component with the coeff. k_2). The formula is applied to the systems $H_2-N_2-H_2O$, $CO-C_6H_6-C_{10}H_8$, and CO_2-H_2O -sucrose.

E. R.

Solvents, acids, bases, and salts. K. WICKERT (Z. physikal. Chem., 1937, **178**, 361—373).—Bronsted's concept of acid and base is not applicable to solutions in which the solvent is incapable of yielding H^+ ions, e.g., it does not account for $SOCl_2$ and K_2SO_3 being acid and base, respectively, in liquid SO_2 . A generalised theory is advanced according to which salts and bases are substances the components of which bear positive and negative charges and have a completed electronic configuration, whilst for acids and H_2O -like solvents only the negative component has a completed configuration.

R. C.

Correlation of ionisation constants of organic acids with dipole moments. J. F. J. DIRRY (Nature, 1937, **139**, 591).—The relation between the strengths of substituted and unsubstituted acids in the benzoic and phenylacetic series and the dipole moments of monosubstituted benzenes is discussed.

L. S. T.

Dissociation constants of polybasic acids. III. W. R. MAXWELL and J. R. PARTINGTON (Trans. Faraday Soc., 1937, **33**, 670—678; cf. A., 1936, 797).—Consideration of the dissociation consts. (k) of benzene-mono-, -di- (2), -tri- (3), -tetra- (3), -penta-, and -hexa-carboxylic acids leads to the conclusion that the inhibiting effect of ionised carboxyl groups is a function of their no. and distance from the dissociating group. From the magnitude of the "last" k of certain members of a series, the approx. magnitude of that of other members of the series can be predicted. Examples are given. The influence of $\cdot CO_2 \cdot$ on the k of adjacent $\cdot CO_2H$ is discussed from the point of view of thermodynamics.

F. L. U.

Common ion effect in some aqueous solutions as shown by the Raman effect. J. H. HIBBEN (Physical Rev., 1937 [ii], **51**, 593—594).—The suppression of ionisation of aq. $ZnCl_2$ by adding the common Cl^- is shown by the increase in intensity of the $\Delta\nu$ 280 Raman line.

N. M. B.

Dissociation constants and structures of zwitterions. A. NEUBERGER (Proc. Roy. Soc., 1937, A, **158**, 68—96).—The influence of a charged substituent on the free energy of ionisation of a dissociating group is examined with reference to the electrostatic effect, propagated through the solvent,

and the chain effect, transmitted through the mol. Approx. vals. of the dipole distances of zwitterions, obtained from a comparison of their dissociation consts. with those of related compounds, suggest that $\omega-NH_2$ -acids exist in solution as nearly straight-chain mols. Dipole distances are also calc. from comparison of dissociation consts. of zwitterions and corresponding fatty acids in H_2O and in aq. EtOH. The prep. of ω -amino- n -dodecoic acid hydrochloride, Et γ -amino- n -butyrate, and Et δ -aminovalerate hydrochloride, m.p. 100—102°, is described; the dissociation consts. of those and other $\omega-NH_2$ -acids, their esters, glycylglycine, and N -acetyl glycine have been measured by means of cells involving liquid junction potentials. The apparent dissociation consts. of zwitterions change with the ionic strength of the solution in a manner different from either acids or bases.

G. D. P.

Equilibrium constants in terms of activities (cryoscopic). VI. Pyridine p -chlorophenoxide in benzene and in p -dichlorobenzene. W. R. BURNHAM and W. M. MADGIN (J.C.S., 606—608).—The true equilibrium const. $K_a - a_{AB}/a_A a_B$ has been determined for the dissociation of the chlorophenoxide in C_6H_6 and in p - $C_6H_4Cl_2$ at 277° and 324.3° abs. Application of these vals. to the van 't Hoff isochore gives for the heat of formation, Q , -480 g.-cal. K_a is considerably $>$ that for other amine-phenol compounds, whilst Q is much less. It is considered that the compound may be polar.

A. J. M.

Diffuse double layer. A. VOET (Kolloid-Z., 1937, **79**, 15—18).—Theoretical. The Debye-Hückel approximation cannot be used satisfactorily in calculating the potential in the diffuse double layer. When the mean thickness of the latter is small compared with the dimensions of the particles the field may be regarded as uniform, and the theory of the plane double layer is applicable.

F. L. U.

Thermodynamic study of systems of the type $PbCl_2-RCl-H_2O$ at 25°. VII. E. R. HOUNSELL and H. N. PARTON (Trans. Faraday Soc., 1937, **33**, 629—633).—The e.m.f. of concn. cells containing $PbCl_2$ in presence of $LiCl$, $NaCl$, and KCl has been measured in such a way that a source of error present in earlier determinations (A., 1933, 906; 1935, 582) is eliminated. Activity coeffs. of $PbCl_2$ are calc. The formation of complex ions is indicated, KCl having the greatest, and $LiCl$ the least, effect.

F. L. U.

Ion equilibrium in heavy water. C. DRUCKER (Trans. Faraday Soc., 1937, **33**, 660—670).—From measurements of the e.m.f. of $Pt-H_2$ and $Pt-D_2$ concn. cells the solution pressures of H_2 and D_2 have been shown to be equal. In liquid H_2O-D_2O mixtures equilibrium between all the components is instantaneously attained. A table of concns. of H_2O , D_2O , and HDO , and of partial pressures of H_2 , D_2 , and HD , corresponding with mixtures of varying composition, is given, and the ionic activities calc. from these data agree with those found from potential measurements. The relation between the velocity of mutarotation of glucose and the concn. of the several ions in H_2O-D_2O mixtures is discussed.

F. L. U.

General course of the decomposition of aqueous solutions of ferric chloride. J. GUÉRON (Compt. rend., 1937, 204, 1119—1121).—For the initial stages of hydrolysis, after an induction period t_0 , the electrical conductivity is given by $\lambda/\lambda_0 - 1 = [p(\log t_0 - 2.230) + 0.408] \log(t/t_0)$, t being measured in min.; the const. p varies with the age of the solution used, and the nature of the reaction vessel.

A. J. E. W.

Hydrolysis of inorganic salts and benzenesulphonates of copper. V. ČUPR and J. ŠIRVOEK (Coll. Czech. Chem. Comm., 1937, 9, 68—75; cf. A., 1934, 599).—Measurements of e.m.f. by the quinhydrone electrode at 20° show that the p_H vals. of 0.1—1.0M-aq. $\text{Cu}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, $\text{Cu}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$, and $(\text{X} \cdot \text{C}_6\text{H}_4\text{SO}_3)_2\text{Cu} \cdot x\text{H}_2\text{O}$ are given by $p_H = -\log[\text{Cu}^{++}] + 3.95$, where x is generally 6, and X is H, *o*-Me, *p*-Me, *m*-Cl, *p*-Cl, *p*-Br, *p*-I, or *p*-OH. The p_H vals. of CuSO_4 solutions are $>$ those given by the equation owing to the reaction $\text{SO}_4^{--} + \text{H}^+ = \text{SO}_4\text{H}'$. The salt $(p\text{-C}_6\text{H}_4\text{I} \cdot \text{SO}_3)_2\text{Cu} \cdot 6\text{H}_2\text{O}$ has been prepared.

J. G. A. G.

System sodium thiosulphate-silver thiosulphate in the dissolved and crystalline state. W. BRINTZINGER and W. ECKARDT (Z. anorg. Chem., 1937, 231, 327—336).—In solutions containing < 30 wt.-% of $\text{Na}_2\text{S}_2\text{O}_3$ the stable complex is $\text{Na}_2[\text{Ag}_2(\text{S}_2\text{O}_3)_2]$ (I), whilst in 39—43 wt.-% of $\text{Na}_2\text{S}_2\text{O}_3$ the complex is $\text{Na}_{10}[\text{Ag}_2(\text{S}_2\text{O}_3)_6]$ (II). With 30—39 wt.-% of $\text{Na}_2\text{S}_2\text{O}_3$ the complexes coexist. Solid (I) separates from solutions in which the salts are dissolved in equimol. proportions. Solutions containing (II) yield the solid compound $\text{Na}_3\text{Ag}(\text{S}_2\text{O}_3)_2 \cdot 2\text{H}_2\text{O}$, whilst solutions containing both (I) and (II) yield cryst. $\text{Na}_5\text{Ag}_3(\text{S}_2\text{O}_3)_4 \cdot 2\text{H}_2\text{O}$.

J. W. S.

Composition of the dissolved single particles of sodium uranyl acetate, sodium zinc uranyl acetate, and sodium magnesium uranyl acetate. H. BRINTZINGER and F. JAHN (Z. anorg. Chem., 1937, 231, 342—344).—Solutions of these compounds all contain the ion $[\text{UO}_2(\text{OAc})_3]'$. The salts crystallising from these solutions should therefore be formulated $\text{Na}[\text{UO}_2(\text{OAc})_3]$, $\text{NaMg}[\text{UO}_2(\text{OAc})_3] \cdot 9\text{H}_2\text{O}$, and $\text{NaZn}[\text{UO}_2(\text{OAc})_3] \cdot 6\text{H}_2\text{O}$, respectively.

J. W. S.

Dialysis method. V. Influence of the foreign electrolyte concentration on the magnitude of the dialysis coefficient. H. BRINTZINGER and W. ECKARDT (Z. anorg. Chem., 1937, 231, 337—341; cf. A., 1931, 416).—For solutions of $\text{Ag}_2\text{S}_2\text{O}_3$ and Na_2CrO_4 in $\text{Na}_2\text{S}_2\text{O}_3$ the dialysis coeff. (λ) of the CrO_4^{--} , $[\text{Ag}_2(\text{S}_2\text{O}_3)_2]'$, and $[\text{Ag}_2(\text{S}_2\text{O}_3)_6]^{10-}$ ions varies with the $[\text{Na}_2\text{S}_2\text{O}_3]$ according to the relation $\log \lambda = A - B[\text{Na}_2\text{S}_2\text{O}_3]$ where B is const. for all three ions. Hence, within the concn. limits investigated the wt. of the Ag ions is independent of the $[\text{Na}_2\text{S}_2\text{O}_3]$.

J. W. S.

Cyanide hæmochromogen. Ferriheme hydroxide-cyanide reaction: its mechanism and equilibrium as determined by the spectrophotometric method.—See A., III, 163.

Solubility product of thallos iodide at 25°. C. W. DAVIES and R. A. ROBINSON (Trans. Faraday

Soc., 1937, 33, 633—635).—The val. calc. from results of conductometric titrations is 6.47×10^{-8} .

F. L. U.

Activity coefficient of thallos thiocyanate. F. ISHIKAWA and N. HASEGAWA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 146—151).—The solubility of TiCNS in H_2O in presence of KNO_3 , K_2SO_4 , TiNO_3 , Ti_2SO_4 , and KCNS has been measured at 25°; the activity coeff. is calc. from the data.

H. J. E.

Salting out of gases and volatile non-electrolytes. J. W. BELTON (Trans. Faraday Soc., 1937, 33, 653—659).—Theoretical. The activity coeff. (f) of a non-electrolyte is given by $e^{E/RT}$, where E is the electrical work involved in the passage of ions across the interface. E is calc. from the change in polarisability of the non-electrolyte mol., and the equation of Debye and McAulay is obtained. A more exact expression for f , including the permanent moment of the non-electrolyte mol., is derived, and its application to cases for which experimental data are available is discussed.

F. L. U.

M.-p. diagram of refractory oxides. VIII. Systems containing cerium dioxide. H. VON WARTENBERG and K. ECKHARDT (Z. anorg. Chem., 1937, 232, 179—187; cf. this vol., 137).—M.-p.-composition curves have been determined for the systems $\text{CeO}_2\text{-CaO}$, $\text{CeO}_2\text{-TiO}_2$, $\text{CeO}_2\text{-ThO}_2$, $\text{CeO}_2\text{-Fe}_3\text{O}_4$, $\text{CeO}_2\text{-Mn}_2\text{O}_3$, $\text{CeO}_2\text{-Cr}_2\text{O}_3$, $\text{ThO}_2\text{-TiO}_2$, $\text{MgO-La}_2\text{O}_3$, and $\text{ZrO}_2\text{-La}_2\text{O}_3$. The existence of CeCrO_3 is indicated, but no compounds are formed in the remaining systems. The m.p. of Cr_2O_3 (2435°) has been determined.

E. S. H.

Carbon-oxygen equilibrium in molten steel. S. MATOBA (Tetsu-to-Hagane, 1935, 21, 875—879).—The equilibrium has been studied at 1550—1650° by melting Fe in a $\text{CO} + \text{CO}_2$ atm.

Ch. Abs. (e)

Binary systems containing AsBr_3 . N. A. PUSHIN (Bull. Soc. Chim. Yougoslav., 1936, 7, 73—77).—The fusion diagrams of the systems $\text{AsBr}_3\text{-chloral hydrate}$, $\text{-CH}_2\text{Ph}_2$, $\text{-C}_6\text{H}_6$, -BzOH , $\text{-}m\text{-C}_6\text{H}_4(\text{NO}_2)_2$, $\text{-}p\text{-nitroaniline}$, -anthracene , and -phenanthrene afford no evidence of compound formation.

R. T.

Carbamide as a hygroscopic substance. E. A. WERNER (Nature, 1937, 139, 512).—When exposed at 16° to air saturated with H_2O vapour, $\text{CO}(\text{NH}_2)_2$ absorbs approx. 1.75 times its wt. of H_2O in 8 days, after which absorption ceases. The nitrate shows no increase in wt. under similar conditions. The hydrochloride absorbs much H_2O when exposed to air under ordinary conditions.

L. S. T.

Equilibria in liquid systems containing furfuraldehyde. B. A. LLOYD, S. O. THOMPSON, and J. B. FERGUSON (Canad. J. Res., 1937, 15, B, 98—102).—Solubility curves and tie lines have been determined for the systems $\text{COMe}_2\text{-H}_2\text{O}$ -furfuraldehyde (I), $\text{H}_2\text{O-EtOAc}$ -(I), and $\text{H}_2\text{O-iso-C}_5\text{H}_{11}\text{-OAc}$ -(I) at 25°.

R. S. B.

Acenaphthene compounds. N. N. EFREMOV, D. L. FEDERMEER, and K. J. PRINKMANN (Bull. Acad. Sci. U.R.S.S., 1936, 515—532).—The fusion

diagrams suggest 1:1 compounds in the systems acenaphthene (I)—1:2:4-chloro-, m.p. 65.7°, and -bromo-dinitrobenzene, m.p. 58.6°, $-m\text{-C}_6\text{H}_4(\text{NO}_2)_2$, m.p. 72.6°, and $-o$ -nitrophenol, m.p. 65.5° (decomp.). A 1:2 compound, m.p. 51.6°, is formed in the system (I)—3:4-dinitrotoluene, and a 1:3 compound, m.p. 119.5°, in the system (I)— m -nitroaniline. Compound formation is not observed in the systems (I)— o - $\text{C}_6\text{H}_4\text{Cl}\cdot\text{NO}_2$ and o -, m -, and $-p\text{-C}_6\text{H}_4\text{Br}\cdot\text{NO}_2$, -2:5-dinitrotoluene, and -2:4-dinitrophenol.

R. T.

Differential tensimeter without a tap. Vapour pressure of deuterates of copper sulphate. H. PERPEROT and F. SCHACHERL (J. Phys. Radium, 1935, [vii], 6, 439—440).—Apparatus is described. Preliminary measurements show that the v.p. of $\text{CuSO}_4\cdot 5\text{D}_2\text{O}$ and $\text{CuSO}_4\cdot 3\text{D}_2\text{O}$ are < those of the corresponding hydrates.

O. D. S.

Physical studies of non-aqueous solvates. II. Vapour pressure of magnesium bromide-diethyl ether solutions. H. H. ROWLEY (J. Amer. Chem. Soc., 1937, 59, 621—625; cf. A., 1936, 1194).—Data for Et_2O saturated with MgBr_2 have been obtained at 0—25°; further data are recorded for other solutions at 25°. The vals. are greatly affected by the presence of small amounts of H_2O .

E. S. H.

Tertiary system potassium nitrate—nitric acid—water. V. I. NIKOLAEV, S. K. CHIRKOV, and A. G. KOGAN (Kali, 1935, No. 7, 23—27).—Equilibrium data are given. The compound $\text{KNO}_3\cdot 2\text{HNO}_3$ is very stable in presence of excess of HNO_3 and yields 99.8% pure HNO_3 and pure KNO_3 when heated to 100—120°.

CH. ABS. (e)

Ternary systems barium hydroxide and water with barium chloride, thiocyanate, chlorate, or acetate at 25°. H. W. FOOTE and F. C. HICKEY (J. Amer. Chem. Soc., 1937, 59, 648—650).—Equilibrium data are recorded. The existence of $\text{BaOH}\cdot\text{CNS}$ is established and that of $\text{BaOH}\cdot\text{Cl}\cdot 2\text{H}_2\text{O}$ confirmed. No basic chlorate or acetate is formed at 25°.

E. S. H.

Dispersion-type of solid solutions in the system $\text{NiCl}_2\text{—NH}_4\text{Cl—H}_2\text{O}$. N. S. KURNAKOV and V. S. EGOROV (Bull. Acad. Sci. U.R.S.S., 1936, 507—514).—At 25° and 50° the solubility curve consists of three parts, one of which relates to hydrated NiCl_2 and the two others to the two series of solid solutions which are found to exist. The composition of the solid phases corresponds throughout with $\text{NiCl}_2\cdot\text{H}_2\text{O}$ —1:2. The max. amount of NiCl_2 in solid solution at 0° is 5%. At 50° in the NH_4Cl -rich solid solution the NiCl_2 content reaches 24.2%, at which val. it is in equilibrium with a solid solution of the second series containing 26.8% NiCl_2 . At 50° the max. amount of NiCl_2 present in the second series is 51.2%. Examination of the crystals indicates that $\text{NiCl}_2\cdot 2\text{NH}_4\text{Cl}\cdot 2\text{H}_2\text{O}$ does not exist. The second series of solid solutions is produced by dissolution of NH_4Cl in $\text{NiCl}_2\cdot\text{NH}_4\text{Cl}\cdot 2\text{H}_2\text{O}$ whilst the first series represents a solution of Ni -carnallite in NH_4Cl .

D. C. J.

Equilibria in aqueous lead chloride solutions. L. WILKINSON, N. O. BATHURST, and H. N. PARTON

(Trans. Faraday Soc., 1937, 33, 623—628).—Data for the system $\text{PbO—HCl—H}_2\text{O}$ at 50° and 80° are given. Basic salts can exist in equilibrium with HCl up to 0.006*M* at 50° and 0.02*M* at 80°. The existence of $2\text{PbO}\cdot\text{PbCl}_2$, $3\text{PbO}\cdot\text{PbCl}_2\cdot\text{H}_2\text{O}$, and $4\text{PbO}\cdot\text{PbCl}_2$ is indicated. Data are also given for $\text{NH}_4\text{Cl—PbCl}_2\text{—H}_2\text{O}$ and $\text{NH}_4\text{Br—PbBr}_2\text{—H}_2\text{O}$ at 25°, and compared with those of previous workers.

F. L. U.

Equilibrium reactions of importance in chemical analysis. Equilibrium constants of the reactions: I. $\text{BaCO}_3 + \text{SO}_4'' \rightleftharpoons \text{BaSO}_4 + \text{CO}_3''$, II. $\text{CaC}_2\text{O}_4 + \text{Pb}'' \rightleftharpoons \text{PbC}_2\text{O}_4 + \text{Ca}''$, III. $\text{BaC}_2\text{O}_4 + \text{CO}_3'' \rightleftharpoons \text{BaCO}_3 + \text{C}_2\text{O}_4''$. N. A. TANANAEV (J. Appl. Chem. Russ., 1937, 10, 340—348, 349—353, 354—359).—I [with S. J. SCHNAIDERMAN]. At equilibrium, attained in 12 days at room temp., 86% of the Ba is present as sulphate and 13.7% as carbonate. The equilibrium const. *K* found experimentally agrees with the theoretical val. if a correction for increased *K* due to hydrolysis of BaCO_3 is applied.

II [with A. I. VOLKOVA]. 98% of the $\text{C}_2\text{O}_4''$ is present as PbC_2O_4 at equilibrium, which is attained after 55 hr at 8°.

III [with N. V. JUNITZKAJA]. 95.3% of the Ba is present as BaCO_3 at equilibrium, attained after 55 hr. at room temp. The val. of *K* found does not agree with that calc. from the solubility products.

R. T.

Solid-liquid equilibria in systems of organic components. VI. Ternary systems with limited miscibility in the molten state. K. HRYNKOWSKI, H. STASZEWSKI, and M. SZMYT (Z. physikal. Chem., 1937, 178, 293—305; cf. A., 1936, 1340).—The equilibrium diagrams for the systems $\text{NHPh}_2\text{—CO(NH}_2\text{)—resorcinol}$ and $\text{S—}\alpha\text{-C}_{10}\text{H—NH}_2\text{—resorcinol}$ have been determined. If into a system of two components *A* and *B* partly miscible in the molten state a third substance *C* is introduced which forms an additive compound with *A* and a homogeneous liquid phase with *B*, then in the system *AC—B* there is a large miscibility gap owing to the weakened residual affinity of *C* for *B*.

R. C.

Portion of the system $\text{CaO—Al}_2\text{O}_3\text{—Fe}_2\text{O}_3$. H. F. McMURDIE (J. Res. Nat. Bur. Stand., 1937, 18, 475—483).—The solidus-liquidus relations in the $\text{CaO—4CaO}\cdot\text{Al}_2\text{O}_3\cdot\text{Fe}_2\text{O}_3\text{—CaO}\cdot\text{Al}_2\text{O}_3$ region have been studied. Solid solutions are formed to a limited extent between the Fe compound and the three Ca aluminates (cf. A., 1928, 367).

F. J. G.

Equilibria between metals, sulphides, and silicates in the melt. V. Equilibria $\text{Fe} + \text{CoO} \rightleftharpoons \text{Co} + \text{FeO}$ and $\text{Ni} + \text{CoO} \rightleftharpoons \text{Co} + \text{NiO}$ in the melt. W. JANDER and A. KRIEGER (Z. anorg. Chem., 1937, 232, 39—56; cf. A., 1934, 365, 734).—Both these equilibria obey the ideal mass action law to a first approximation. With increase of temp. their equilibrium consts. (*K*) increase according to $\log K = A - B/T$. On addition of SiO_2 , *K* increases with increasing $[\text{SiO}_2]$ for the first equilibrium, but decreases for the second. The heats of reaction deduced, however, are not in complete accord with

thermal data. This may be qualitatively explained by the change of O content in the metal.

J. W. S.

Slag systems. R. HAY, J. WHITE, and A. B. MCINTOSH (J. West Scotland Iron Steel Inst., 1935, 42, 99—104; cf. A., 1935, 35).—The non-existence of grunerite, $\text{FeO} \cdot \text{SiO}_2$, is indicated by thermal and optical data. A previously unidentified substance (n 1.74) is a eutectic of fayalite and SiO_2 . Data are given for the system $\text{FeO}-\text{MnO}-\text{SiO}_2$. In the system $\text{MnO}-\text{Al}_2\text{O}_3$, addition of Al_2O_3 lowers the m.p. of MnO from 1785° to the eutectic (1520° , 24% Al_2O_3). The compound $\text{MnO} \cdot \text{Al}_2\text{O}_3$ melts at 1560° . Al_2O_3 is sol. in solid MnO . The reaction of $\text{FeO}-\text{MnO}-\text{SiO}_2$ slags with C has been studied at 1310° .

CH. ABS. (c)

Thermodynamics of irreversible processes. M. V. TOVBIN (Bull. Sci. Univ. Kiev, 1936, 2, 143—158).—Theoretical.

R. T.

Franck's principle of photochemical energy balance and its application to reversible oxidation-reduction reactions. G. HOLST (Acta Physiochim. U.R.S.S., 1937, 6, 137—141).—The application of Franck's principle (A., 1925, ii, 1077) to reversible oxidation-reduction systems in which the free energy change can be measured potentiometrically is illustrated by reference to the systems: methylene-blue + $\text{NHPh} \cdot \text{NH} \cdot \text{SO}_3'$ leuco-base + $\text{PhN} \cdot \text{N} \cdot \text{SO}_3'$ (cf. A., 1936, 292), quinone quinol, and $(\text{CH}_2 \cdot \text{CO}_2\text{H})_2$ $(\text{CH} \cdot \text{CO}_2\text{H})_2$ in presence of succinodehydrogenase and a suitable colouring matter.

F. L. U.

Heat of dissolution and dilution of saturated aqueous solutions of certain salts. A. S. FEDOROV and G. F. SILTSCHENKO (Ukrain. Chem. J., 1937, 12, 53—60).—Dissolution of anhyd. salts (KCl , KBr , KNO_3 , NH_4Cl , NH_4Br , and NH_4NO_3) and dilution of the solutions are endothermic processes. In the case of salts forming crystal hydrates (BaCl_2 , CuCl_2 , CuSO_4 , ZnSO_4) evolution of heat takes place until sufficient H_2O has been added to form the hydrate, after which heat is absorbed up to formation of a saturated solution, dilution of which is associated with evolution of heat.

R. T.

Thermochemistry of hydrocarbons. M. BRUTZCUS (Compt. rend., 1937, 204, 574—576; cf. this vol., 223).—The intrinsic calorific val. (P) of a free gaseous C atom, deduced from vals. for the hydrocarbons, is 456.6 kg.-cal. per g.-atom, in accord with previous results. For any hydrocarbon C_mH_n $P = 456.6(m + n/4)$ kg.-cal. per g.-mol. Thermal data suggest that double or triple linkings do not occur in unsaturated hydrocarbons, C^{II} being present. C_6H_6 contains 9 C-C linkings.

A. J. E. W.

Heats of formation of ethylene oxide, ethylene glycol, and of some homologues. H. MOUREU and M. DODÉ (Bull. Soc. chim., 1937, [v], 4, 637—647).—Heats of combustion and of formation of $(\text{CH}_2 \cdot \text{OH})_2$ and 8 homologues, and of $(\text{CH}_2)_2\text{O}$ and 2 homologues are recorded.

H. J. E.

Heats of combustion and refractivity data of pentenoic esters. E. SCHJANBERG (Z. physikal. Chem., 1937, 178, 274—281; cf. A., 1936, 166).—The

energy of fission of the C:C linking, which has been calc. from measurements of the heat of combustion of esters of valeric and the three pentenoic acids, is a max. when the double linking is in the $\alpha\beta$ position and a min. when in the $\gamma\delta$ position to the CO_2H group. It falls with increasing size of the alkyl groups of the alcohol component. The refractivity and dispersivity increment of the C:C linking differ appreciably according as this is in the $\alpha\beta$ or $\beta\gamma$ position. It is inferred that there is an interaction of the fields of the C:C and C:O linkings which varies with the size of the alkyl radical.

R. C.

Conductivity of univalent electrolytes in water. R. A. ROBINSON and C. W. DAVIES (J.C.S., 1937, 574—577).—The data of Shedlovsky (A., 1932, 699) for the variation of conductivity with concn. (c) of aq. solutions of LiCl , NaCl , KCl , and HCl at 25° can be expressed by Onsager's limiting equation, for $c < 0.001N$; by $\Lambda = \Lambda_0 - b(c^{1/2} - c + 0.001)$ for $c = 0.002-0.02N$, and by $\Lambda = \Lambda_0 - b \cdot f(c)$ for $c > 0.02N$. $f(c)$ is the same for all electrolytes, and b is const. These equations, applied to the data of Shedlovsky for KNO_3 and AgNO_3 , indicate that these salts are incompletely dissociated, the dissociation consts. (25°) being 1.6 and 1.5, respectively. The conductivities of aq. solutions of TiClO_4 and TlOAc have been determined at $c < 0.01N$, and the dissociation consts. of TiClO_4 , TlOAc , TlNO_3 , and TiCl calc.

A. J. M.

Measurement of conductance of electrolytes. VIII. Re-determination of the conductance of Kohlrausch's standard potassium chloride solutions in absolute units. G. JONES and M. J. PRENDERGAST (J. Amer. Chem. Soc., 1937, 59, 731—736; cf. A., 1935, 449).—The abs. sp. conductances of $1N$ -, $0.1N$ -, and $0.01N$ - KCl for use as reference standards in conductivity measurements have been redetermined. Corrections to be applied to conductance data have been calc.

E. S. H.

Conductivities and potentials of higher alkylpyridinium chlorides. A. LOTTERMOSER and H. FROTSCHER (Kolloid-Beih., 1937, 45, 303—358).—The prep. of alkylpyridinium chlorides (I) is described. The m.p. are: *octyl*- about 30° ; *decyl*- 54.5° ; *dodecyl*- 82.5° ; *tetradecyl*- 75.5° ; *hexadecyl*- 82° ; *octadecyl*- 86° . Conductivities over a wide range of concn. have been determined at 25° , 40° , 50° , and 60° . Temp. coeffs. and cationic mobilities are calc. Cl' potentials have been measured under the same conditions, and the Cl' activity coeffs. (f') calc. The Λ -concn. and f' -concn. curves are similar except at high dilutions. There are no qual. differences between the physicochemical behaviour of (I) and that of substances with capillary-active anions. Colloidal properties are barely detectable in the C_8 member. Surface tension (σ) measurements show (I) to be less capillary-active than the corresponding Na alkyl sulphates. The min. σ occurs at a concn. slightly above that at which mol. aggregation is shown by the electrical measurements to begin.

F. L. U.

Conductance of electrolytic systems. M. A. KLOTSCHKO (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 197—201).—Theoretical. The variation

of conductance with temp. and viscosity is discussed from the point of view of Kurnakov's theory.

O. D. S.

Electro-chemical study of group II and V bromides in solutions of aluminium bromide in ethyl bromide. E. J. GORENBEIN (Bull. Sci. Univ. Kiev, 1936, 2, 115—128).—Ca, Sr, and Ba bromides are only very slightly sol. in EtBr-AlBr₃ mixtures, the conductivity (κ) of which is scarcely affected by their presence. Solubility and κ rise in the series ZnBr₂ < CdBr₂ < HgBr₂; BiBr₃ < SbBr₃ < AsBr₃. Electrolysis results in deposition of Hg, Cd, Sb, or Bi at the cathode.

R. T.

Transport number of silver in solutions of sodium thiosulphate practically saturated with silver chloride. P. VAN RYSSELBERGHE and S. M. KNAPP (J. Amer. Chem. Soc., 1937, 59, 762—763).—Measurements at 25° afford direct evidence for the existence of AgS₂O₃'.

E. S. H.

Transport of ions in presence of colloids. J. J. BIKERMAN (Trans. Faraday Soc., 1937, 33, 560—564).—The mobility of NH₄⁺ ions is diminished by the presence of colloidal As₂S₃. Causes of the observed retardation are discussed.

F. L. U.

Relations among fundamental electrochemical quantities. III. I. UHARA (J. Chem. Soc. Japan, 1935, 56, 1364—1367).—The relative vals. of the electrode potentials of non-metals have been calc. from thermodynamic considerations.

CH. ABS. (e)

Mercurous acetate electrode. W. D. LARSON (J. Physical Chem., 1937, 41, 493—498).—From measurements made in presence of 0.05—2.0 mol. AcOH, the calc. e.m.f. of the electrode Hg|Hg₂(OAc)₂, OAc' is -0.5109 ± 0.0002 volt at 25°.

C. R. H.

Electrode potentials of lithium, rubidium, and calcium in liquid ammonia. V. A. PLESKOV (Acta Physicochim. U.R.S.S., 1937, 6, 1—10; cf. A., 1936, 161).—The normal potentials of Li, Rb, and Ca have been calc. from measurements of the potential of the respective amalgams in liquid NH₃. The vals. are: Li 2.99, Rb 2.68, Ca 2.39, referred to the H electrode in H₂O.

F. L. U.

Electromotive force of non-aqueous cells. III. Sulphate and hydrogen electrodes in anhydrous hydrazine. H. Ulich and K. BIASTOCH (Z. physikal. Chem., 1937, 178, 306—314; cf. this vol., 188).—The electrodes Zn amalgam|ZnSO₄ and Cd amalgam|CdSO₄ behave satisfactorily as electrodes of the second kind in anhyd. N₂H₄. A H electrode also yields const. and reproducible potentials. Determinations of activity coeffs. (f) of solutions of N₂H₄.H₂SO₄ have shown that N₂H₄.H₂SO₄ behaves as a ternary electrolyte and that the f -concn. curve is more nearly of the theoretical form than in H₂O.

R. C.

Electrokinetic potential at metal surfaces. J. F. CHITTUM and H. HUNT (Trans. Electrochem. Soc., 1937, 71, Preprint 10, 85—95).—The electrokinetic potentials of several metals in various electrolytes and colloidal solutions have been determined. Experimental evidence is adduced to show that the properties of a metallic electrode, especially its

electrokinetic potential, are determined by a colloidal metallic surface layer.

J. W. C.

Potential differences at the boundaries of two liquid phases. VII. K. KARCZEWSKI (Rocz. Chem., 1937, 17, 61—63).—Potentials at the interfaces iso-C₅H₁₁.OH-0.000001-1.0N-HCl, -KCl, and -KOH have been measured.

R. T.

Potentials at phase boundaries in the process of flotation. B. KAMIENSKI and L. BENIS (Rocz. Chem., 1937, 17, 89—96).—The electrostatic potential of conducting substances (galena, CuS), but not of insulators (ZnS, glass), $\propto p_H$ of the solution.

R. T.

Constancy of static liquid junction potentials in complex systems and their application to the titration of weak bases. A. L. FERGUSON, R. HITCHENS, and K. VAN LENTE (Trans. Electrochem. Soc., 1937, 71, Preprint 28, 323—337).—The reproducibility and constancy of certain cells have been studied in relation to the titration of weak bases. The added bases include NH₃, NH₂Ph, and glycine, the amount of each being increased in steps up to 0.1M. The liquid junction potential method of titration is quant. for the titration of NH₃ with HCl, fairly so for NH₂Ph, but only approx. for glycine. An explanation of the form of the titration curves is advanced.

J. W. C.

Behaviour of cells in which one electrode is polished. Role of the Beilby layer. A. GRUMBACH and F. TABOURY (Compt. rend., 1937, 204, 1178—1179).—A polished Au or Pt electrode, immersed in an electrolyte solution by which it is not attacked, behaves as a condenser shunted by a high resistance. The effect is attributed to the presence of a Beilby layer.

A. J. E. W.

Oxidation-reduction potentials. III. Relations between oxidation-reduction potential and reaction velocity. G. HOLST (Z. physikal. Chem., 1937, 178, 282—292; cf. A., 1936, 292).—The velocity coeff., k_1 , of the forward reaction of methylene-blue + NPh.NH.SO₃' \rightleftharpoons leucomethylene-blue + PhN:N.SO₃' varies considerably with the p_H and is a min. at $p_H \approx 5.2$. The velocity coeff. of the reverse reaction, k_2 , changes little with the p_H . k_1/k_2 rises with falling p_H . The fall in with rising p_H up to p_H 4 is due primarily to a fall in activation energy, E , by the same amount as the change in free energy of the reaction rises, and the fall in the latter is due to rise in the reduction-oxidation potential or electron affinity of the dye by the corresponding amount.

R. C.

Polarographic studies with the dropping mercury cathode. LXIV. Equations of current-voltage curves in the reversible electro-reduction of a weak electrolyte, Hg(CN)₂. J. TOMES (Coll. Czech. Chem. Comm., 1937, 9, 81—103).—Current-voltage curves obtained with Hg(CN)₂ solutions at p_H 6—13 conform generally to theoretical requirements. Deviations are found in unbuffered solutions, and in alkaline solutions probably owing to complex formation between Hg(CN)₂ and CN' liberated at the cathode during electrolysis. In agreement with theory, the "half-wave" potential

at $p_H > 8$ is $\tau_1 = -0.029 \log [\text{Hg}(\text{CN})_2] +$ and at $p_H > 10$ is const. and independent of p_H . By adding Cd^{++} to $\text{Hg}(\text{CN})_2$ solutions, the polarographic waves due to Cd and Hg are displaced, respectively, to positive and negative potentials owing to interaction of Cd^{++} with CN^- . J. G. A. G.

Polarographic studies with the dropping mercury cathode. LXV. Catalytic effect due to $\beta\beta'$ -dichloroethyl sulphide (mustard gas). R. BRDIČKA (Coll. Czech. Chem. Comm., 1937, 9, 76—80; cf. A., 1933, 619, 681, 964).— $(\text{CH}_2\text{Cl}\cdot\text{CH}_2)_2\text{S}$ (I) is not directly polarographically active, but as little as $2 - 5 \times 10^{-6}$ g. in 1 c.c., when boiled with aq. NH_3 and added to ammoniacal Co^{++} or Co^{+++} containing NH_4Cl , produces on the current-voltage curve a catalytic effect similar to that produced by the $\cdot\text{SH}$ group. Since the effect increases with concn. of (I), (I) can be determined empirically. J. G. A. G.

Polarographic studies with the dropping mercury cathode. LXVI. General formulæ for the potential of electroreduction of fumaric and maleic acid. P. HERASYMENKO (Coll. Czech. Chem. Comm., 1937, 9, 104—108).—By taking account of the degree of ionisation of the acids, a relation has been found between p_H and electroreduction potentials which agrees more closely with the experimental data (cf. A., 1936, 1342). J. G. A. G.

Electrolysis of potassium bromide in liquid ammonia. E. I. ACHUMOV and L. I. DRUZIANKOVA (J. Gen. Chem. Russ., 1937, 7, 298—304).—Solubility (-84° to 98°), v.p. and conductivity (-31° to 30°) and d (20°) are given for $\text{KBr}\cdot\text{NH}_3$. Electrolysis results in formation of KNH_2 at the cathode and of NH_4Br in the anode. R. T.

Overvoltage of hydrogen at amalgam [surfaces]. P. Z. FISCHER and V. F. BARABANOV (Bull. Sci. Univ. Kiev, 1936, 2, 97—107).—Measurements of overvoltage at amalgam cathodes (1—80% Cd , 1—40% Pb , 5—30% Bi , and 0.5—20% Zn) in 0.1N- H_2SO_4 reveal deviations from additivity, which are ascribed to changes in the structure and surface tension of the amalgams. R. T.

Iodine overpotential in molten electrolytes. S. KARPATSCHOV and O. POLBORATSKAJA (Acta Physicochim. U.R.S.S., 1937, 6, 275—278).—The I overpotential at a C electrode in molten $\text{AgI} + \text{AgCl}$ and in LiI — LiCl has been measured at various c.d. Within the limits of error, the overpotential is independent of the composition of the melt. J. W. S.

Adsorption and overvoltage. S. VON NARAY-SZABÓ (Z. physikal. Chem., 1937, 178, 355—360).—Various otherwise inexplicable features of overvoltage, e.g., the protracted rise on bright Pt, may be accounted for by supposing that the first stage in the separation of H is the transfer of H^+ ions into an adsorbed film on the electrode surface (cf. A., 1936, 297). Since adsorbed H is separated at more negative potentials than "free" H (this vol., 140), highly adsorptive metals such as Pt permit the easy separation of H, and at low c.d. H is initially separated solely in the adsorbed state, and for this reason certain theories of overvoltage are inapplicable. With increasing

saturation of the surface, separation by adsorption becomes relatively unimportant, the overvoltage increases, and the above theories become valid.

R. C.

Theory of passivity. XXXI. Passivity of chromium. W. J. MULLER and J. Z. BRIGGS (Monatsh., 1937, 70, 113—145; cf. A., 1936, 1468).—From the action of acid on Cr and from its anodic behaviour it would appear that the metal is always covered to a considerable extent with an oxide film. On activation by use as cathode or by the action of HCl , the free surface of the metal increases to about 3%, whereas normally it is about 0.1% and decreases on anodic or self-passification to about 0.01%. Active Cr goes into solution in the Cr^{II} state at anode potentials < 0.5 volt, as a mixture of Cr^{II} and Cr^{III} at 0.5—1.0 volt, and as Cr^{III} and Cr^{VI} at > 1.2 volts. At > 2 volts development of O_2 also occurs at the oxide film. These results are in accord with the porosity theory of anodic passivity. The behaviour of active Cr in H_2SO_4 at low potentials indicates that the pores have a mean diameter of 40×10^{-8} cm. The greater c.d. in the larger pores explains the regions over which mixed ions pass into solution. J. W. S.

Passivity of iron and steel in nitric acid solution. XV. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 152—165; cf. this vol., 188).—The dissolution of two active Fe electrodes in aq. HNO_3 is accelerated by the passage of an a.c. The passivity of Fe in conc. HNO_3 is destroyed by passing an a.c. at 4 volts. H. J. E.

Use of aluminium amalgam electrode for determining the activity of aluminium ions in aqueous solutions. Z. J. BERESTNEVA and V. A. KARGIN (J. Phys. Chem. Russ., 1936, 8, 800—804).—For amalgams containing 10^{-6} to 5×10^{-6} g. of Al per g. of Hg the potential in AlCl_3 solutions remains const. for some min. This potential varies with $[\text{AlCl}_3]$ in agreement with Nernst's law; it becomes more positive when the Al content of the amalgam decreases. J. J. B.

Potentiometric analysis of micelle formation. M. N. FISCHER and E. I. KVIAT (Kolloid. Shurn., 1936, 2, 539—542).—Changes of the potential of Pt associated with the hydrolysis of FeCl_3 have been measured. J. J. B.

Potentiometric titration of sodium salts of fatty acids. A. LOTTERMOSER and A. K. GHOSE (Kolloid-Beih., 1937, 45, 253—302).—The p_H of soap solutions cannot be determined satisfactorily with the H or quinhydrone electrode, but satisfactory and reproducible results are obtainable with an Sb electrode. The latter has been used for the potentiometric titration of aq. solutions of Na salts of saturated fatty acids C_6 , C_8 , C_{10} , C_{12} , C_{14} , C_{16} , C_{18} , Na oleate, and Na abietate with HCl . In addition to the equivalence point, breaks in the curve corresponding with the formation of acid soaps were found in the following cases: 0.004N- NaC_{16} (2); 0.007N- NaC_{14} (2 at room temp., 1 at 50°); 0.03—0.1N- NaC_{12} (2); 0.01N- NaC_{10} (1 at room temp.); 0.005N-Na oleate (1 very weak); 0.01N-Na abietate (1 at 50° at about 0.6 equiv. HCl).

The breaks become less marked or may vanish with increasing dilution and with rise of temp. F. L. U.

p_H of reference solutions. Y. KAUKO and A. AIROLA (Z. physikal. Chem., 1937, **178**, 437—454).—Owing to uncertainties in e.m.f. measurements arising from liquid-junction potential, E , the accuracy of the p_H of the reference solutions used in p_H measurements is uncertain. For measuring the p_H of dil. solutions the use of a reference solution consisting of $10^{-4}M$ - $NaHCO_3$ saturated with pure CO_2 under 1 atm. is advocated; E is either negligible or can be calc. The p_H of this solution has been measured at 0° , 25° , and 38° by means of a cell with a very small diffusion potential, and is reproducible within ± 0.002 . The H^+ activity of Veibel's solution has been determined by reference to this standard. R. C.

Transition state in chemical kinetics. M. POLANYI (Nature, 1937, **139**, 575—576).—A summary. L. S. T.

Transition state in chemical reactions. M. POLANYI (J.C.S., 1937, 629—635).—A general exposition is given of the methods and results obtained by applying the transition state concept to reaction velocity problems. J. G. A. G.

Transition state method in chemical kinetics. C. N. HINSHELWOOD (J.C.S., 1937, 635—641).—The transition state method and the kinetic method of treating reaction velocity problems are compared. J. G. A. G.

Thermodynamics and the rates of coupled or reversed reactions. P. VAN RYSELBERGHE (Science, 1937, **85**, 383—384). L. S. T.

Calculation of second-order reaction velocity constants. J. M. STURTEVANT (J. Amer. Chem. Soc., 1937, **59**, 699—702).—Theoretical. E. S. H.

Reaction between hydrogen and oxygen above the upper explosion limits. G. VON ELBE and B. LEWIS (J. Amer. Chem. Soc., 1937, **59**, 656—662).—Theoretical. The mechanism is discussed. E. S. H.

Kinetics of oxidation of hydrides in the gas phase. III. Oxidation of hydrogen sulphide. B. JAKOVLEVA and P. SCHANTAROVITSCH (J. Phys. Chem. Russ., 1937, **9**, 112—131).—The self-inflammation of $H_2S + O_2$ has been studied. In addition to the previously known region of self-inflammation at high pressures another has been found at < 50 mm. It has an upper limit increasing, and a lower limit decreasing, with temp. ("peninsula" on the p - t inflammation diagram). The lowest temp. at which inflammation occurs in this region is 285° (for $2H_2S + 3O_2$). A slow oxidation occurs outside the self-inflammation region; this reaction is different from the explosive one. The different effects of increase in $[O_2]$ on the inflammation limits in the case of H_2S , H_2 , and CO (shift to lower temp.) and in that of PH_3 and SiH_4 (no effect) are both compatible with the chain mechanism. E. R.

Mechanism of reaction of nitric oxide with oxygen, chlorine, and bromine. III. Rate of formation of nitrosyl chloride. W. KRAUSS and M. SARACINI (Z. physikal. Chem., 1937, **178**, 245—

254; cf. A., 1936, 294).—The reaction $2NO + Cl_2 = 2NOCl$ at 273.2 — 463° abs. follows the termol. law at all concns., the fluctuations in the termol. velocity coeff. reported by other investigators (A., 1925, ii, 552) being ascribed to experimental error. The temp. coeff. is ~ 1.2 . R. C.

Second pressure limit of inflammation for spark ignition. F. A. LAVROV and A. L. BESTCHASTNI (Acta Physicochim. U.R.S.S., 1935, **1**, 975—984).—From experiments with various CH_4 -air mixtures, it is shown that a second (upper) pressure limit exists for ignition, that it depends largely on the energy of the discharge, increase of which broadens the region of inflammation, and that it disappears on reducing $[CH_4]$. It is evidently independent of any catalytic influence on the part of the walls of the reaction vessel as has been suggested by Haber and Aleya (cf. A., 1930, 1528). C. R. H.

Spectrographic studies of the explosive combustion of methane. J. BELL (Proc. Roy. Soc., 1937, **A**, 158, 429—454).—Spectrographic investigation of the explosion flames of CH_4-O_2 mixtures burning under different pressures shows that H_2O is produced by thermal decomp. of intermediate oxidation products and not by the combustion of H_2 . $MeOH$ and CH_2O have been isolated in the products of combustion. G. D. P.

Explosion waves and shock waves. IV. Quasi-detonation in mixtures of methane and air. W. PAYMAN and W. C. F. SHEPHERD (Proc. Roy. Soc., 1937, **A**, 158, 348—367).—Small-scale experiments on CH_4 -air mixtures, ignited by Al-cased PbN_6 detonators, show the explosion to differ from detonation in that the speed is not uniform. The explosion is called "quasi-detonation" because the energy maintaining the wave is not wholly derived from the combustion of CH_4 . Cu-cased Hg fulminate detonators do not ignite CH_4 -air mixtures. They ignite a 9.5% CH_4-O_2 mixture. PbN_6 detonators set up detonation in this CH_4-O_2 mixture at a considerably higher rate. In large-scale experiments an explosion similar to detonation was set up in a 9.1% CH_4 -air mixture ignited by a charge of high explosive. This quasi-detonation is propagated at a speed of 1900 m. per sec. High flame speeds were also observed in CH_4 -air mixtures ignited by detonating $2H_2 + O_2$. The effect of restrictions in and of closing the gallery at both ends is investigated. G. D. P.

Thermal decomposition of ethane. E. W. R. STEACIE and N. W. F. PHILLIPS (J. Chem. Physics, 1937, **5**, 275).—A reply to Sachsse (this vol., 248). W. R. A.

Flammability of propane-air mixtures. Range at low pressures. H. W. VAN DER HOEVEN (Ind. Eng. Chem., 1937, **29**, 445—446).—The limits of "flammability" of C_3H_8 and air under reduced pressure have been compared with the limits for CH_4 -air mixtures. The "flammability" of C_3H_8 -air ceases at a considerably higher pressure than that of CH_4 -air. Intensity of the spark has an important influence but no explosion could be produced below 210 mm. Hg. C. C.

Two-stage mechanism for the low-temperature spontaneous combustion of hydrocarbons. B. V. ARVAVOV and M. B. NEUMANN (Acta Physicochim. U.R.S.S., 1937, 6, 279—288).—Study of the combustion of $C_5H_{12}-O_2$ mixtures at 304—440° shows that the reaction proceeds in two stages, ignition or explosion being preceded by formation of a cold flame. There are two induction periods, one applying to each reaction. The results explain certain phenomena observed in the operation of internal-combustion engines. J. W. S.

Reactions between atomic deuterium and saturated aliphatic hydrocarbons. N. R. TRENNER, K. MORIKAWA, and H. S. TAYLOR (J. Chem. Physics, 1937, 5, 203—211).—The extent of deuteration of CH_4 , C_2H_6 , C_3H_8 , and $n-C_4H_{10}$ by D between 0° and 300° has been followed by fractionation analysis and by determination of the thermal conductivities of the products of deuteration. Approx. vals. for the activation energies of the various processes are deduced and are shown to conform to suggested mechanisms. Deuteration of alkyl radicals proceeds more quickly than deuteration of saturated hydrocarbons. The energies of the Me-H and Me-Me linkings are 108 and 97.6 kg.-cal., respectively; discrepancies between these vals. and existing data are discussed. Results derived from activation energies are subject to considerable influence from the uncertainty of the steric factor. W. R. A.

Equilibrium and kinetics [of diene synthesis] in the gaseous state and in solution. G. A. BENFORD, (MISS) B. S. KHAMBATA, and A. WASSERMAN (Nature, 1937, 139, 669—670).—The reaction $2 \times$ cyclopentadiene \rightarrow dicyclopentadiene is homogeneous and bimol. both in the gaseous state and in paraffin solution. L. S. T.

Ternary and quaternary explosion regions and Le Chatelier's formula. A. LA FLEUR (Rec. trav. chim., 1937, 56, 442—473).—The following explosion limits in air were obtained: 3.0—3.2 and 13.9—14.4% C_2H_4 ; 7.7 and 72.6% H_2 ; 18.3 and 72.7% CO; 6.7 and 12.4% $C_2H_4Cl_2$; 5.2 and 5.6% Bu^iBr . Three quaternary systems, viz., $H_2-C_2H_4-CO$ -air, $H_2-C_2H_4-CO_2$ -air, and $N_2-C_2H_4-CO_2$ -air, were investigated and examined graphically from the point of view of Le Chatelier's law. A closed explosion region was found in the second system. Three ternary systems, viz., C_2H_4 -air- $C_2H_4Cl_2$, C_2H_4 -air- $C_2H_4Br_2$, and C_2H_4 -air- Bu^iBr , were similarly examined. C. R. H.

Thermal decomposition of methyl nitrite. A. G. CARTER and M. W. TRAVERS (Proc. Roy. Soc., 1937, A, 158, 495—498).—In disagreement with the results of Steacie and Shaw (A., 1934, 1312) the decomp. of $MeO \cdot NO$ is found not to be a first-order reaction. G. D. P.

Influence of pressure on spontaneous ignition and limits of inflammability of ether-air mixtures. D. T. A. TOWNEND and E. A. C. CHAPMAN (Proc. Roy. Soc., 1937, A, 158, 415—429).—The influence of pressure on the ignition temp. of 1, 2, 5, and 10% Et_2O -air mixtures has been determined. The results are similar to, but not identical with,

those observed for the higher paraffin hydrocarbons. The analogy between the influence of pressure on ignition points and limits of inflammability is discussed. G. D. P.

Reaction velocity and solvation. Theory of the hydrolysis of ethylene bromide with alcoholic alkali hydroxide. A. L. BERNOUILLI and J. KASPAR (Helv. Chim. Acta, 1937, 20, 462—468; cf. A., 1934, 36).—A general equation is derived theoretically for the velocity coeff. of this hydrolysis. Its variation with temp. and with addition of H_2O is also deduced. J. W. S.

Kinetics of bimolecular reactions in solution. J. K. SYRKIN (Acta Physicochim. U.R.S.S., 1935, 1, 855—870).—The no. of mol. collisions and the probability of a collision being followed by a reaction are discussed mathematically. (Cf. A., 1936, 165.) C. R. H.

Kinetics of oxidation of cobalt in ammoniacal solution. M. CHATELET (Compt. rend., 1937, 204, 857—858).—The rate of oxidation is dependent on $[NH_4Cl]$ and $[NH_3]$, the initial velocity with const. $[NH_4Cl]$ being \propto the concn. of $[Co(NH_3)]^{+}$ present (cf. A., 1936, 797). The max. extent of oxidation increases with $[NH_3]$, reaching a limit at which one atom of O is absorbed per atom of Co. A. J. E. W.

Formation and decomposition of quaternary ammonium salts in solution. W. C. DAVIES and R. G. COX (J.C.S., 1937, 614—621).—The kinetics of the reversible reaction $p-C_6H_4Br \cdot NMe_2 + C_3H_5Br \rightleftharpoons p-C_6H_4Br \cdot NMe_2 \cdot C_3H_5 \cdot Br$ have been investigated in 5—15% aq. $COMe_2$ and $CHCl_3$ at 35—65°. The formation of the salt is bimol. and the decomp. is unimol. At equilibrium at approx. 65°, the salt is almost completely decomposed in $CHCl_3$ but is only half decomposed in 10% aq. $COMe_2$ and the yield increases with $[H_2O]$. The velocity coeff., k , and the equilibrium const. K for aq. $COMe_2$ are almost independent of concn. of reactants, but in $CHCl_3$ K increases with dilution, possibly owing to complex formation. In $CHCl_3$, k also increases with dilution, but in very dil. solutions, $k \propto$ initial salt concn. and this is attributed to a negative catalysis. *p*-Fluoro-, -chloro-, m.p. 153°, and -iodo-phenyldimethylallylammonium bromide, m.p. 150—160°, were prepared and their decomp. investigated. J. G. A. G.

Functional relation between the constants of the Arrhenius equation. R. A. FAIRCLOUGH and C. N. HINSHELWOOD (J.C.S., 1937, 538—546).—The rates of alkaline hydrolysis of $MeOAc$ and $EtOBz$, the formation of methylpyridinium iodide, and the hydrolysis of $EtBr$ were determined in mixtures of H_2O with $EtOH$, dioxan, and $COMe_2-EtOH$ at 0—80°, and a correlation was found between vals. of E and $\log PZ$ defined by the reaction rate equation $k = PZe^{-E/RT}$. These results, in conjunction with data from the lit., show that the correlation is probably not fortuitous. An interpretation is based on statistical principles and the assumption of a time interval between activation and reaction. Factors controlling the magnitude of P are discussed. J. G. A. G.

Hydration of unsaturated compounds. V. Rate of hydration of acetylene in aqueous solu-

tion of sulphuric acid and mercuric sulphate. R. H. FRIEMAN, E. R. KENNEDY, and H. J. LUCAS (J. Amer. Chem. Soc., 1937, 59, 722—726; cf. this vol., 135).—The initial rate of hydration of C_2H_2 in aq. H_2SO_4 - $HgSO_4$ is of the first order with respect to $[C_2H_2]$ and of the second with respect to $[HgSO_4]$. Reaction is probably formation of $C_2H_2 \cdot 2Hg(HSO_4)_2$, followed by hydration. At later stages the rate of reaction $\propto [C_2H_2]^{1/2}$, but this is complicated by and may be due to irregular interference by $MeCHO$. C_2H_2 is determined by $KBrO_3$ - KBr in presence of Hg^{++} (< 1 atom per Br) and back-titration in presence of $NaCl$. R. S. C.

Comparative study of oxidation of glucose 6-phosphate and glucose.—See A., II, 177.

Kinetics of the hydrolysis of dialkyl phosphites. I. By hydrogen and hydroxyl ions. II. Acid and base catalysis. P. NYLÉN (Svensk Kem. Tidskr., 1937, 49, 29—52, 79—96).—I. The hydrolysis of Me , Et , Pr^a , Pr^b , and Bu^a di- to monophosphites has been followed iodometrically. 0.01—2.0N- HCl , 0.25—2.0N- HBr , and 0.25—2.0N- $HClO_4$ were used with addition of the corresponding Na salt to keep the ionic strength const. The salt effect is weakly positive. H^+ catalysis falls with increasing concn. of acid, but no satisfactory explanation can be found. Alkaline hydrolysis is very rapid and was studied in 0.01N- $Ba(OH)_2$. For H^+ hydrolysis $k_1/k_2 = 10$ approx., and for OH^- 10^6 approx. in every case.

II. Measurements with Et_2HPO_3 are in agreement with the Bronsted theory of acid and base catalysis. H_2O and H_2CO_3 give anomalous results.

M. H. M. A.

Calculation of the activation energy of the rearrangement of ergosterol to calciferol. J. R. OWEN and A. SHERMAN (J. Amer. Chem. Soc., 1937, 59, 763—764).—The activation energy lies between 72 and 92 kcal. The mechanism is discussed.

E. S. H.

Influence of temperature on periodic reactions. V. K. NIKIFOROV and A. P. RUNTZO (Kolloid. Shurn., 1937, 3, 45—59; cf. this vol., 183).—The const. of periodicity of the reactions $AgNO_3 + K_2Cr_2O_7$ and $AgNO_3 + Na_3AsO_4$ in gelatin and agar increases with rising temp. or in the presence of citric acid or KNO_3 ; $Ca(NO_3)_2$ diminishes this const. J. J. B.

Method of study of chemical systems by variation of mass with linearly variable temperature. II. Theoretical study of curves and applications. P. VALLET (Ann. Chim., 1937, [xi], 7, 367—423; cf. B., 1936, 506).—The mathematics of thermal decomp. reactions, as determined by loss-of-wt. measurements, at const. and with linearly rising temp. are discussed with reference to published data.

E. S. H.

Relation between absorption of gases by liquid absorbents and the viscosity of the latter. E. M. PREIS, M. A. NIKOLAEVA, and P. M. TSCHERKASSKAJA (J. Appl. Chem. Russ., 1936, 9, 2179—2191).—The rate of absorption of CO_2 by aq. KOH containing glycerol or sucrose inversely $\propto \eta$ of the

medium. Substances lowering surface tension increase the rate of absorption by solutions of high η .

R. T.

Physical influences on the rate of dissolution of polyoxymethylenes.—See A., II, 228.

Comparison of the initial velocities of the reactions between iron oxides and hydrogen, carbon oxide, and mixtures thereof. G. I. TSCHUFAROV and E. P. TATIEVSKAIA (J. Phys. Chem. Russ., 1936, 8, 933—942). H_2 reduces magnetite at 500° about 20 times, and at 800° about 10 times, as rapidly as does CO ; for hæmatite the corresponding ratios are 15 and 6. In mixtures, CO restrains the reduction by H_2 . All the reactions are slower at 800° than at 500°, owing to disappearance of active centres.

J. J. B.

Oxidation of nickel spherules. G. VALENSI (Bull. Soc. chim., 1937, [v], 4, 668—670; cf. this vol., 88).—Data for Ni spheres of 1.6 mm. and 0.8 mm. diameter are recorded (1073—1288° abs.). At const. temp., a function of m , the fraction of the Ni oxidised, defined by $F(m) = 2.471 - (1 - m)^{3/2} - 1.471(1 + 0.68m)^{2/3} = (38.14/r_0^2)e^{-22420/Tt}$, \propto the time, t .

H. J. E.

Luminescence phenomena produced by the detonation in air and in a vacuum of certain priming explosives. H. MURAOUR and A. LANGEVIN (J. Phys. Radium, 1936, [vii], 7, 417—419).—By using a photographic film mounted on a rotating drum a tracing has been obtained of the luminous effects produced by the detonation of certain explosives in air and in a vac. The speeds of the various condensation waves set up by the detonation have been evaluated; they are of the same order of magnitude as the calc. speed of sound within the products of the explosion at high temp.

W. R. A.

Spectrographic study of the detonation of priming explosives in a vacuum. H. MURAOUR (J. Phys. Radium, 1936, [vii], 7, 411—416).—By detonating certain priming explosives in a vac., particularly the nitrides and fulminates of heavy metals, it is possible to obtain excitations of the free atoms of the metal not obtainable by ordinary flame spectra. The phenomenon might be used to elucidate the mechanism of detonations.

W. R. A.

Inhibition of thermal decomposition of n -butane by nitric oxide. L. S. ECHOLS and R. N. PEASE (J. Amer. Chem. Soc., 1937, 59, 766—767).—Decomp. of n -butane at 500° is inhibited by small amounts of NO . The mechanism is discussed.

E. S. H.

Effect of iodine on rates of decomposition of formaldehyde, acetaldehyde, and propaldehyde. G. K. ROLLEFSON and R. F. FAULL (J. Amer. Chem. Soc., 1937, 59, 625—629).—The rates of decomp. of $MeCHO$ and $EtCHO$ at 500° are markedly accelerated by I , but that of CH_3O is hardly affected. The mechanism of reaction is discussed.

E. S. H.

Catalysis of maleic-fumaric isomerisation by hydrogen ions.—See A., I, 228.

Halogens as catalysts. H. J. SCHUMACHER (Trans. Electrochem. Soc., 1937, 71, Preprint 26, 297—312).—Thermal and photochemical reactions

catalysed by halogen atoms and mols. are summarised and discussed. J. G. A. G.

Effect of negative catalysts on thermal decomposition of hydrogen peroxide in solution. B. J. DAIN and K. M. EPSTEIN (J. Phys. Chem. Russ., 1936, 8, 896—903).—The rate of unimol. decomp. of H_2O_2 in absence of a catalyst is decreased by $\text{PhOH} > \text{COEt}_2 > \text{COMeEt} > \text{MeOH} > \text{COMe}_2$. J. J. B.

Influence of admixtures on polymerisation of butadiene in the presence of sodium. N. A. TSCHAJANOV and Z. N. NEMTZOVA (Kolloid. Shurn., 1936, 2, 487—494).—The polymerisation of $(\text{CH}_2\text{CH})_2$ is retarded by alcohols (EtOH , $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$) aldehydes (especially by $o\text{-OH}\cdot\text{C}_6\text{H}_4\cdot\text{CHO}$), and ketones (especially by $\text{CH}_3\text{Ac}\cdot\text{COPr}^\beta$). These admixtures also alter the properties of the polymerides. J. J. B.

Temperature coefficients in the anion-catalysed decomposition of nitramide. E. C. BAUGHAN and R. P. BELL (Proc. Roy. Soc., 1937, A, 158, 464—478).—The velocity of decomp. of nitramide has been studied at 15°, 25°, 35°, and 45°, the catalysts used being H_2O (the "spontaneous" reaction), Bu^+CO_2^- , OAc^- , OBz^- , HCO_2^- , $o\text{-OH}\cdot\text{C}_6\text{H}_4\cdot\text{CO}_2^-$, $\text{CH}_2\text{Cl}\cdot\text{CO}_2^-$, $\text{CHCl}_2\cdot\text{CO}_2^-$, and $o\text{-NO}_2\cdot\text{C}_6\text{H}_4\cdot\text{CO}_2^-$. The results show that Brønsted's equation relating catalytic const. to dissociation const. is valid and that Arrhenius' equation is obeyed by each catalyst. The variation in the consts. of this equation for different catalysts is discussed. G. D. P.

Synthetic dehydrogenases. Synthetic carbonylases.—See A., II, 261.

Mechanism of catalytic exchange reactions of heavy hydrogen. A. FARKAS and L. FARKAS (Trans. Faraday Soc., 1937, 33, 678—690).—The rate of exchange between gaseous D_2 and H_2O , Bu^+OH , β -ethylhexanol, Et_2O , COMe_2 , and C_6H_6 in both the gaseous and liquid states has been studied, and compared with that of the *ortho*-*para* H_2 conversion. A Pt catalyst was used. With H_2O and the alcohols the reaction is much faster in the vapour than in the liquid, whilst with COMe_2 and C_6H_6 the difference is much smaller. In the vapour phase the exchange rates are similar for H_2O and the alcohols, and much smaller for Et_2O and C_6H_6 . Pt effects the exchange only of the hydroxylic H in alcohols. The exchange rates with H_2O and alcohols in the vapour phase, and with all the compounds in the liquid phase, differ only slightly from that of the *para*- H_2 conversion. The results are explained by assuming that dissociation into atoms occurs on the catalyst, and that both partners are present in the adsorption layer. F. L. U.

Catalytic union of hydrogen and oxygen on copper and copper-gold alloys. A. B. VAN CLEAVE and E. K. RIDEAL (Trans. Faraday Soc., 1937, 33, 635—643; cf. A., 1930, 1129; 1936, 422).—In the reaction between H_2 and O_2 (4:1, 2:1, and 1:1) on Cu at 170—250° at pressures >0.15 mm., the gases disappear in the ratio 1:1, 1 mol. of Cu_2O being formed for each mol. of H_2O . The apparent energy of activation in the early stages (on freshly reduced Cu) is 13.0 kg.-cal., and later on the partly oxidised Z (A., I.)

surface 6.0 kg.-cal. True catalytic union occurs only on surfaces containing a large proportion of CuO , with an activation energy of 9 kg.-cal. The rate-determining process is considered to be activated migration of O retained as Cu_2O into remoter layers of Cu, probably through the reaction $\text{Cu}_2\text{O} \rightleftharpoons \text{CuO} + \text{Cu}$. The mechanism suggested is supported by experiments with Cu-Au alloys. F. L. U.

Catalytic decomposition of ozone at metal surfaces. L. I. KASCHTANOV, N. P. IVANOVA, and V. P. RISHOV (J. Appl. Chem. Russ., 1936, 9, 2176—2178).—The catalytic activity at 100° falls in the series $\text{Ag} > \text{Zn-Hg} > \text{Cu-Hg} > \text{brass} > \text{steel} > \text{Zn} > \text{Fe} > \text{Au} > \text{Ni} > \text{Pt} > \text{Sn} > \text{Pb} > \text{Cu} > \text{Al}$. R. T.

Mechanism of the catalytic combustion of ammonia. M. BODENSTEIN (Trans. Electrochem. Soc., 1937, 71, Preprint 25, 277—296).—Experiments with $\text{NH}_3\text{-O}_2$ mixtures at 0.005–0.02 mm. impinging on a Pt strip at 1140—1350° and subsequently striking the wall of the vessel cooled by liquid air, whereby products were condensed, show that NH_2OH and HNO_2 are intermediate products in the combustion of NH_3 . The data are consistent with the processes: (1) $\text{NH}_3 + \text{O}_{(\text{adsorbed})} = \text{NH}_2\text{OH}$, (2) $\text{NH}_2\text{OH} + \text{O} = \text{HNO} + \text{H}_2\text{O}$, (3) $\text{NH}_2\text{OH} + \text{NH}_3 = \text{N}_2 + \text{H}_2\text{O} + 2\text{H}_2$, (4) $\text{NH}_2\text{OH} + \text{O} = \text{HNO} + \text{H}_2\text{O}$, (5) $2\text{HNO} = \text{N}_2\text{O} + \text{H}_2\text{O}$. It is probable that NH_2OH rather than NH is a primary product. Some of the main secondary reactions appear to occur in the gas phase. J. G. A. G.

Sulphuric acid catalysis with ferric oxide. B. NEUMANN and G. HEINTKE (Z. Elektrochem., 1937, 43, 246—254).—The dissociation pressures of FeSO_4 , $\text{Fe}_2(\text{SO}_4)_3$, and $\text{Fe}_3(\text{SO}_4)_4$ have been determined in the range 300—700° and partial SO_3 pressures and heats of dissociation have been calc. $\text{Fe}_2(\text{SO}_4)_3$ does not form a basic salt. The mechanism of catalysis of H_2SO_4 production is reviewed in the light of the data obtained. E. S. H.

Vanadium catalysts [for sulphuric acid].—See B., 1937, 434, 435.

Influence of SO_2 and SO_3 on the activity of tin-chromium catalysts. I. E. ADADUROV and D. V. GERNET (J. Appl. Chem. Russ., 1937, 10, 245—256).—The catalyst (1:1 $\text{Cr}_2\text{O}_3\text{-SnO}_2 + 3\% \text{SbCl}_3$) does not react with dry SO_2 or SO_3 at 200—400°, and is only slightly reversibly inactivated by the wet gases. The X-ray diagram given by 1:0.433 $\text{Cr}_2\text{O}_3\text{-SnO}_2$ does not exhibit lines characteristic of SnO_2 ; it is concluded that Sn is present as a complex compound. The constituent crystallites of the catalyst have a diameter of $>10^{-5}$ cm. R. T.

Adsorption and decomposition of carbon monoxide on zinc oxide catalysts. R. L. BURWELL, jun., and H. S. TAYLOR (J. Amer. Chem. Soc., 1937, 59, 697—699).—When CO is passed over ZnO at $>184^\circ$ the reaction $2\text{CO} \rightleftharpoons \text{C} + \text{CO}_2$ occurs at the surface. The deposited C is removed by H_2 in the same temp. region, probably as CH_4 . E. S. H.

[Catalytic] synthesis of methane from carbon monoxide and hydrogen.—See B., 1937, 414.

"True" and "conjunct" catalytic polymerisation of olefines.—See A., II, 223.

Catalytic toxicity and chemical structure.
I. Relative toxicity of sulphur compounds in catalytic hydrogenation. E. B. MAXTED and H. C. EVANS (J.C.S., 1937, 603—606).—In the hydrogenation of crotonic acid catalysed by Pt powder and of olive oil catalysed by Ni on kieselguhr, the relative inhibiting effects per g.-atom of S are $\text{H}_2\text{S} < \text{S} < \text{CS}_2 < \text{thiophen} < \text{cysteine}$. The results are discussed with reference to the widely different activity of the catalysts and the effect of the attached atoms or groupings on the inhibiting effect of the S atom. J. G. A. G.

Nickel as a catalyst. O. B. J. FRASER (Trans. Electrochem. Soc., 1937, 71, Preprint 33, 397—457).—The prep. and use of Ni, Ni compounds, and Ni alloys as catalysts are summarised with full lit. references. J. W. S.

Metallic oxides as catalysts in certain organic chemical processes. P. K. FROLICH (Trans. Electrochem. Soc., 1937, 71, Preprint 20, 223—240).—The catalysis of reactions involving mainly hydrogenation, dehydrogenation, hydration, and dehydration is reviewed. J. G. A. G.

Decomposition of tetralin peroxide. IV. Effect of sulphur and sulphur compounds. T. YAMADA (J. Soc. Chem. Ind. Japan, 1937, 40, 44—47B).—S, $(\text{C}_5\text{H}_{11})_2\text{S}$, PhSH, and PrSH change the reaction from one of the first order to an autocatalytic reaction. The formation of a decomp. product having a strongly catalytic effect on the reaction is offered in explanation. C. R. H.

Determination of oxygen in activation of alkaline-earth oxide cathodes. H. ISENSEE (Z. physikal. Chem., 1937, B, 35, 309—316).—The liberation of O_2 by electrolytic decomp. of BaO used as a cathode activator has been followed by using the $\text{H}_2\text{—O}_2$ reaction under low pressure, amounts of O_2 down to 2×10^{-6} g. being determinable. With a Pt cathode coated with a mixture of alkaline-earth oxides the proportion of the conduction which is electrolytic, n , is $\sim 0.2\%$ at the start of activation, and when about 0.2% of the oxide mols. have been electrolytically reduced to Ba by the emission current the conduction is entirely electronic. With pure BaO protected from reducing agents n remains const. With pure SrO at $950\text{—}1080^\circ$ there is no electrolysis. In the activation of technical oxide cathodes electrolysis plays only a minor part. The activated state of alkaline-earth oxide cathodes largely persists even after treatment with O_2 . BaO often contains an excess of Ba, and it is possible that when it is anodically polarised at high temp. the electrons of the excess of Ba tend to migrate towards the surface and so increase its emissivity. R. C.

Electrolytic growth of metal crystals. II. Growth of silver crystals from molten salts. T. ERDEY-GRUZ and R. F. KARDOS. III. Growth of copper crystals from aqueous solutions. T. ERDEY-GRUZ and E. FRANKL (Z. physikal. Chem., 1937, 178, 255—265, 266—273; cf. A., 1935, 450).—II. In the growth of spherical Ag single crystals in molten Ag salts relations quite different from those

prevailing in growth in aq. solutions are observed. Only some of the cryst. faces required by Stranski's theory of crystal growth appear and their rates of growth are not in the theoretical sequence. No satisfactory growth occurs in halide melts. Voltage-current curves in AgNO_3 and $\text{AgNO}_3\text{—KNO}_3$ mixtures indicate that the rate of separation of Ag is determined by the rate of growth of the surface layers or rate of supply of ions to the growing points.

III. No regular growth of spherical Cu single crystals occurs in Cu^{II} salt solutions, but in complex solutions of Cu_2Br_2 and Cu_2Cl_2 crystals in which the prevailing form is the tetrakis-hexahedron or ikositetrahedron combined with the octahedron or rhombododecahedron are formed. Not all the faces required by Stranski's theory appear. The voltage-current curves suggest that the rate of the cathodic process is determined at low c.d. and overvoltage by the rate of supply of ions and at high c.d. and overvoltage by the rate of discharge of the ions. R. C.

KZ and KG_{II} in anodic deposition of silver peroxide. A. GLAZUNOV and R. SOUČEK (Chem. Listy, 1937, 31, 129—133).—Anodic deposition of Ag_2O_2 takes place according to the same laws as cathodic deposition of Ag. R. T.

Electrolytic lead plating of [iron] chemical apparatus.—See B., 1937, 453.

Adhesion of electrodeposited nickel to nickel.—See B., 1937, 452.

Structure of electrodeposited copper.—See B., 1937, 452.

Electrolysis of deuteroacetic acid.—See A., II, 226.

Formation of ethylene during the electrolysis of propionic acid.—See A., II, 227.

Electrolytic reduction of aromatic trinitro-compounds to their respective triamines.—See B., 1937, 459.

Electrolysis of soap solutions.—See B., 1937, 462.

Active hydrogen, oxygen, and nitrogen at pressures up to 20 mm. P. HARTECK and E. ROEDER (Z. physikal. Chem., 1937, 178, 389—406).—By passing a luminous discharge through Ne under 25 mm. containing a small amount of H_2 , O_2 , or N_2 it has been possible to obtain mixtures of the active gases with Ne under such pressure that they could be passed into liquids and their reactions with these examined. The consens. of the active gases were determined. R. C.

Formation of a higher nitrogen oxide (NO_3) in the action of the glow discharge on the gaseous system $\text{NO}_2\text{—O}_2$. A. KLEMENC and W. NEUMANN (Z. anorg. Chem., 1937, 232, 216—224).— NO_3 is not formed by the action of the discharge on NO_2 and O_2 , but is produced by vaporisation of a mixture of NO_2 and O_3 . E. S. H.

Oxidation of nitrogen in the high-frequency luminescent discharge. II. E. N. EREMIN, S. S. VASSILIEV, and N. I. KOBOSOV (J. Phys. Chem. Russ., 1937, 9, 48—64).—The dependence of yield of NO

per unit energy on discharge frequency has been measured. At low energies (e.g., 70 watts) high frequency (e.g., 2.7×10^5 Hz) gives much more NO than low frequency (50 Hz). At high energies (< approx. 90 watts) the relation becomes reversed. The yield is unchanged from 2.7 to 10×10^5 Hz, showing the absence of resonance effects. Dependence of yield or composition of the gas (20–80% N_2) is the same for low and for high frequency. The optimal composition depends on discharge energy, not on frequency. Spectroscopic and electrical characteristics of the discharges used are given and the different chemical actions of high and low frequencies are explained by different electronic temp. and their dependence on energy input.

E. R.

Photo-reaction of chlorine monoxide and hydrogen. T. IREDALE and T. G. EDWARDS (J. Amer. Chem. Soc., 1937, 59, 761).—The photodecomp. of Cl_2O is accelerated by H_2 . The mechanism is discussed. No evidence of the alleged explosive decomp. of Cl_2O in bright light was found.

E. S. H.

Bromine-sensitised decomposition of chlorine monoxide in green light. A. G. BROWN and J. W. T. SPINKS (Canad. J. Res., 1937, 15, B, 113–123).—The decomp. of Cl_2O has been studied at 19° in light of λ 5460 and 3650 Å. for which the quantum yields are $4.3 \pm 10\%$ (sensitised by Br) and 5.3 (unsensitised) respectively, which suggests that both reactions have similar mechanisms. A slow dark reaction occurs in both cases. A photochemical decrease in pressure occurs near the end of the sensitised reaction, probably due to the formation of Cl_2O_6 on the walls, from the Br-sensitised decomp. of Cl_2O . The chain mechanism is discussed and it is considered that the bulk of the evidence favours sensitisation by Br_2 mols.

R. S. B.

Primary process of photodissociation in sulphur trioxide. G. KORNFIELD (Trans. Faraday Soc., 1937, 33, 614–617).— SO_3 absorption bands are produced by irradiation of SO_3 with ultra-violet light of $\lambda > 2760$ Å. This agrees with the assumption that the primary decomp. yields a SO_2 mol. and an O atom in the normal state.

F. L. U.

Theory of photodichroism (Weigert effect). S. NIKITINE (Compt. rend., 1937, 204, 973–975).

A. J. E. W.

Low-intensity solarisation of four emulsions. H. P. GRIGGS (J. Opt. Soc. Amer., 1936, 26, 384–385).—Investigations previously reported (cf. A., 1935, 1211) are extended, and, with three additional emulsions, reversals of a higher order than the second are reported.

N. M. B.

Effect of pre-exposure in spectrum photography. D. NORMAN (J. Opt. Soc. Amer., 1936, 26, 407–408).—An investigation of pre-exposure for five types of Eastman plates is described. The effect was the same in each case. Fading of the latent image amounting to a density decrease of 0.07 at a density level of 0.8 was observed in plates developed 12 hr. after exposure.

N. M. B.

Optical investigation of the latent image and the print-out effect of photographic emulsions.

Z* (A., I.)

A. VAN KREVELD and H. J. JURRIENS (Physica, 1937, 4, 285–296).—Changes in light absorption due to latent image formation were measured for several types of emulsion. The increase in absorption \propto the time of exposure. The latent image and the printing out effect are both due to formation of Ag. The regression theory of solarisation is rejected. Emulsions which are initially insensitive to red light show an auto-accelerating absorption effect with time of irradiation, as Ag accumulates. The effect of red light is that of blue light and the two effects are independent. Ag deposited in the printing out process had an approx. uniform light absorption at λ 5000–7000 Å., as compared with the selective absorption (max. 7000 Å.) observed by Hilsch and Pohl (A., 1930, 1342) for cryst. AgBr after irradiation. H. J. E.

Action of light and of electrons on silver halides. J. J. TRILLAT and H. MOTZ (J. Phys. Radium, 1936, [vii], 7, 89–92).—X-Ray analysis shows the presence of cryst. Ag in photographic emulsions of AgBr after solarisation. The quantity of Ag increases with the time of exposure. The electron diffraction patterns of pure AgBr show no evidence of cryst. Ag after prolonged exposure to electrons or to light. Exposure to electrons causes crystallisation of an amorphous film of AgBr.

O. D. S.

Photoreduction of ferric chloride in alcoholic solutions in light of quartz mercury-vapour lamp. M. PRASAD and V. B. MOHILE (Proc. Nat. Acad. Sci. India, 1936, 6, 261–268).—At const. $[FeCl_3]$ the reaction is of zero order; the rate of reduction is a function of the $[FeCl_3]$. J. S. A.

Mercury-sensitised reactions of methane, deuteromethanes, and the hydrogen isotopes. K. MORIKAWA, W. S. BENEDICT, and H. S. TAYLOR (J. Chem. Physics, 1937, 5, 212–225; cf. A., 1935, 457).—A study of the interactions between CH_4 and D_2 , MeD and H_2 , and CH_4 and MeD under the influence of Hg 2537 Å. at $>40^\circ$ shows that the processes involving formation of deuteromethanes are very complex and the activation energy cannot be accurately determined. Exchange reactions were followed by measurement of the infra-red absorption of products (A., 1937, II, 131) and condensation processes by measuring pressures at const. vol. The quantum efficiency (γ) of the exchange increases about 100-fold in the range 100° to 490° and the inconstancy of the temp. coeff. demands a chain mechanism, increasing in length at higher temp. Variation of the light intensity indicates a change in mechanism as the temp. rises. Exchange between CH_4 and MeD is that between CH_4 and D_2 , but the temp. effect and the variation of γ and of the temp. coeff. are analogous. The rate of exchange between CH_4 and D_2 approx. = that between MeD and H_2 . Reactant concns. were varied for the reaction of CH_4 and D_2 at 196° and 392° and the results postulate different kinetics at the two temp. For 98° the composition of the products differs from the equilibrium distribution usually found at higher temp. Only saturated higher hydrocarbons condensed from CH_4 were found at all temp. except the highest, 490° , at which definite traces of unsaturated hydrocarbons

were identifiable. With increasing temp. the extent of condensation decreases; its rate increases as the temp. increases up to 296° but decreases at higher temp. The rate of CH₄ condensation increases with [CH₄], and in presence of D₂ is > in presence of H₂. From consideration of [D] and the life of D it is concluded that diffusion cannot be neglected at higher temp. That the excited Hg is quenched by CH₄ and by MeD giving Me and H or D is adduced from several distinct experimental results. Fifteen possible processes taking place in different temp. ranges are outlined. At <200° the exchange is between CH₄ and D giving principally MeD and to a smaller extent CH₃D + H and CH₂ + HD. Near 200° the reaction is Me + D₂ → MeD + D, whilst at 300° it is CH₄ + D → Me + HD. In condensation reactions alkyl radicals recombine to form the higher hydrocarbons and the sources of such radicals at different temp. are reviewed. Experimental data are analysed on the basis of these mechanisms. W. R. A.

Photochemical formation of tetrachloroethane from *trans*-dichloroethylene and chlorine. K. L. MULLER and H. J. SCHUMACHER (Z. physikal. Chem., 1937, B, 35, 285—297).—The formation of CHCl₂·CHCl₂ from C₂H₂Cl₂ vapour and Cl₂ in light of λ 436 mμ at 80—95° is a chain reaction, and for reactants under 100 mm. pressure at 80° and a light absorption of 10¹⁶ quanta per min. the quantum yield is ~7 × 10³ mol. For C₂H₂Cl₂ pressures >20 mm. the rate is given by $d[\text{C}_2\text{H}_2\text{Cl}_4]/dt = kI_{\text{abs}}[\text{Cl}_2]$, but at lower pressures is influenced by [C₂H₂Cl₂]. The temp. coeff. is 1.13 ± 0.03. The probable reaction scheme is Cl + C₂H₂Cl₂ = C₂H₂Cl₃, C₂H₂Cl₃ + Cl₂ = C₂H₂Cl₄ + Cl, 2C₂H₂Cl₃ = (2C₂H₂Cl₂ + Cl₂) or (C₂H₂Cl₂ + C₂H₂Cl₄). O₂ markedly retards the reaction, apparently by reacting with C₂H₂Cl₃ radicals. R. C.

Photo-iodination of the butenes, propylene, and ethylene at low temperatures. Preparation and photolysis of αβ-di-iodobutane. G. S. FORBES and A. F. NELSON (J. Amer. Chem. Soc., 1937, 59, 693—697).—The photo-reaction was conducted in CHCl₃ at -55° in light of λλ 436, 546, and 644 mμ. The quantum yield for const. concn. and light intensity varies 40-fold for the different olefines, and falls with decreasing frequency to about 0.01 at λ 644 mμ. The prep. of αβ-di-iodobutane (I), m.p. -15 ± 1°, and βγ-di-iodobutane, m.p. -11 ± 2° (decomp.), is described. Photolysis of (I) was conducted at -60°, -20°, and 25°; the quantum yield at 25° is almost the same as that for symmetrical C₂H₄I₂. E. S. H.

Asymmetric photochemical decomposition of complex salts. R. TSUCHIDA, A. NAKAMURA, and M. KOBAYASHI (J. Chem. Soc. Japan, 1935, 56, 1335—1338).—The optical rotatory power of K₃[Co(C₂O₄)₃] for λ 4990 Å. is -5725°. On illumination by dextrorotatory polarised light (λ 5890 Å.) the aq. solution of racemic K₃[Co(C₂O₄)₃] becomes levorotatory. The rotation increases to a max. with time and then decreases. CH. ABS. (e)

Photochemical formation of peroxides. VII. Oxidation of acetic, propionic, butyric, and

isovaleric acids by molecular oxygen with ultra-violet light. R. CANTIENI (Z. wiss. Phot., 1937, 36, 90—95).—The concns. of peroxides formed (e.g., AcO₂H from AcOH) after 1 min. exposure of CH₃O (cf. A., 1936, 1492), AcOH, EtCO₂H, PrCO₂H, and Bu^oCO₂H to ultra-violet light are 3.0, 2.2, 10.0, 8.5, and 3.1, respectively; after 1 hr. exposure, 8.2, 16.8, 172.0, 96.0, 33.0, respectively. Atm. O₂, dried if necessary, was bubbled through during the exposures. The results show that the stability of the per-acids to ultra-violet light passes through a max. with increasing no. of C atoms in the mol. The rate of oxidation and final concns. obtained vary considerably with the concn. of the original acids. J. L.

Photochemical formation of carbonyl chloride. IX. Development and dying out of chain mechanism at beginning and end of illumination. M. BODENSTEIN, W. BRENSCHEDE, and H. J. SCHUMACHER (Z. physikal. Chem., 1937, B, 35, 382—402; cf. A., 1935, 457).—The formation of COCl₂ on intermittent illumination of CO-Cl₂ mixtures has been studied. Reaction continues for about 2 sec. after illumination has ceased, or, if a little O₂ is present, about 25 sec. after. Since small amounts of O₂ retard the stationary photochemical formation of COCl₂ but do not disturb the equilibrium CO + Cl COCl the above effect of O₂ must be ascribed to the formation of an active O-containing intermediate product which has a longer life than Cl and COCl formed in absence of O₂ and initiates new chains in the dark whilst itself slowly decomp. The development and dying out of the chain mechanism can be quantitatively accounted for by the reaction scheme previously proposed and various consts. of the reactions have been calc. In the Cl-sensitised photochemical formation of CO₂ from CO and O₂ on intermittent illumination the after-effects are of similar length to those in the formation of COCl₂ in presence of a little O₂. R. C.

Course of the photolysis of carbonic acid. E. BAUR (Helv. Chim. Acta, 1937, 20, 387—390).—Photochemical assimilation of CO₂ by plants may occur through carbonates or CO₂H groups. Analogy is drawn with electrolytic oxidation-reduction processes, by which H₂CO₃ can yield H₂CO₄ and HCO₂H, respectively. Photochemical sensitizers produce H₂O₂ in presence of H⁺ and O₂, and with CO₃ this gives H₂CO₄. H₂CO₄ with H₂O₂ yields some CH₂O (cf. following abstract), which may be removed by other processes as formed. The photosensitizer may lose CO₂ by the process, this being succeeded by reabsorption from polyphenols, as in the production of pyrogallol and salicyl ion from pyrogallolcarboxylic acid ion and PhOH. J. W. S.

Photochemical formation of formaldehyde from chlorophyll and eosin. E. BAUR and H. FRICKER (Helv. Chim. Acta, 1937, 20, 391—398).—In the presence of org. or inorg. "redox" materials, EtOH solutions of chlorophyll yield traces of CH₂O (from reduction of its CO₂H groups) on exposure to light. Eosin S shows the same effect, but gallo-cyanine, pseudopurpurin, eosin G, and an azo-dye do not. J. W. S.

Attempted theory of photosynthesis. J. FRANCK and K. F. HERZFELD (J. Chem. Physics, 1937, 5, 237—251).—A quant. explanation of the photosynthetic production of O_2 is attempted by assuming four photochemical steps and two dark reactions, in which a peracid, HCO_2H , and a peraldehyde occur. Photolytic decomp. of the per-compounds initiates back chain reactions by which light saturation can be explained. Agreement between observed and calc. vals. is good. Plant acids are photosynthesised in the same way but these can be photo-oxidised in a reaction sensitised by chlorophyll. W. R. A.

Decomposition of air-free water by alpha rays. C. E. NURNBERGER (J. Physical Chem., 1937, 41, 431—436).— H_2O , carefully freed from dissolved air, is decomposed by α -rays. The actions of X-rays and α -rays on H_2O are considered to be essentially different. C. R. H.

Chemical concentration of the radioactive gold isotope. V. MAJER (Naturwiss., 1937, 25, 252—253).—Na Au thiosulphate was irradiated with neutrons, and was then shaken with Hg. After removal of the Hg and addition of some Au the Hg was distilled, and the Au remaining was proved to have a sp. activity $>$ that of the Au in the thiosulphate residue. Another method consisted in irradiating a Au sol on the point of coagulation with neutrons. The sp. activity of the pptd. Au was $>$ that of the Au still remaining in suspension.

A. J. M.
Supersonics in chemistry. E. BAUMGARDT (Chim. et Ind., 1936, 36, 686—695).—The effect of exposing various chemical reactions to supersonic vibrations is discussed. Increased stability of emulsions, ease in obtaining colloidal states, expulsion of dissolved gas, and various biological effects under the action of supersonics are mentioned. W. P. R.

Mechanism of chemical action of supersonics. L. R. SOLOVJEVA (J. Phys. Chem. Russ., 1937, 9, 77—83).—Oxidation of KI under the influence of supersonic waves yields KIO_3 . No H_2O_2 is formed from H_2O . $FeSO_4$ in Mohr's salt is oxidised to $Fe_2(SO_4)_3$. E. R.

Deuterium as a research tool in the physical and biological sciences. H. L. JOHNSTON (Ohio J. Sci., 1935, 35, 362—387).—A summary.

CH. ABS. (c)

Separation of isotopes by diffusion in fast streaming mercury vapour. D. MACGILLAVRY (Rec. trav. chim., 1937, 56, 330—342).—A rapidly moving stream of Hg vapour is used as the membrane for the separation, by diffusion, of the isotopes of the light elements. A simplified theory is developed, in which expressions for the fractionation ratio and rate of flow are derived, but these are not in complete agreement with the experimental results, probably because of neglect of back diffusion and the use of an incorrect diffusion const. The diffuser has been used successfully for the concn. of D_2 in a mixture of H_2 and D_2 . F. J. L.

Attempt at increasing the concentration of heavy water in ordinary water by fractional crystallisation. M. DEZELIĆ (Bull. Soc. Chim.

Yugoslav., 1936, 7, 65—72).—The solidus-liquidus curves of the system D_2O - H_2O coincide, indicating that concn. of D_2O cannot be achieved by fractional crystallisation. R. T.

Sodium tripolyphosphate. H. HUBER (Angew. Chem., 1937, 50, 323—326; cf. this vol., 91).—Melts of $NaPO_3$ with $Na_4P_2O_7$ yield $Na_4P_2O_7$ as the primary product of crystallisation. Chilled melts show evidence of the formation of $Na_5P_3O_{10}$, into which they are converted completely by a solid reaction when heated between 250° and the m.p. The existence of $Na_5P_3O_{10}$ as a separate entity, and its amount when present, may be determined by measurement of its dispersive action on Ca soaps, due to the formation of sol. complexes. $Na_5P_3O_{10}$ is converted on melting into $Na_4P_2O_7$ + an amorphous polyphosphate. Mixtures of $Na_4P_2O_7$ and $NaPO_3$, tempered below the m.p. and then chilled, show a max. Ca-soap val. at the composition $Na_6P_4O_{13}$, which is slowly converted into $Na_5P_3O_{10}$ by heating below 500° . The behaviour parallels that of the polymetaphosphates, and points to the existence of a series of polyphosphates of the general formula $Na_{n+2}P_nO_{3n+1}$. J. S. A.

Crystallisation of silica in $NaPO_3$. G. PEYRONEL (Z. Krist., 1937, 95, 274—281).—Heating SiO_2 gel in molten $NaPO_3$ produces cristobalite. In Na_2WO_4 tridymite is formed; the condition is probably that of the lattice type of the compound of the SiO_2 and the mother-liquor, which for $SiO_2.P_2O_5$ is very similar to that of cristobalite. Various other factors are discussed, and it is concluded that cristobalite can be formed only in neutral melts.

B. W. R.

Linear corrosion of metals. I. Selective corrosion of metals on three-phase boundaries. L. G. GINDIN, D. I. MIRLIS, and F. M. SCHEMJAKIN (J. Phys. Chem. Russ., 1937, 9, 84—90).—The corrosion of Cu by aq. NH_3 , of Fe by H_2SO_4 , and of Mg by HCO_2H and $AcOH$ occurs strongly on the three-phase boundary metal-paraffin-corrosive liquid, causing the formation of deep rills around a paraffin spot on the metal surface. This linear corrosion is sometimes a periodic process. The linear corrosion on the phase boundary does not depend on surface activity of the corroding liquid and is not affected by addition of surface-active substances. E. R.

Etching of copper by ferric chloride solutions.—See B., 1937, 452.

Existence of crystalline cupriperiodates. L. MALAPRADE (Compt. rend., 1937, 204, 979—980).—The prep. of cryst. salts having $Cu^{3+}:I^{7-}:Na = 1:2:7$ and $1:2:5$ is described. A. J. E. W.

Hydrolysis of copper benzenesulphonate. (MLLE.) M. QUINTIN (Compt. rend., 1937, 204, 968—970; cf. A., 1936, 172).—For aq. solutions of $(PhSO_3)_2Cu$, $[Cu^{II}] = K[H^{II}]^3$; hydrolysis occurs by intermediate formation of $Cu(OH)_2$. The mechanism of the hydrolysis of heavy-metal salts depends on the nature of the anion involved. A. J. E. W.

Ketimine compounds formed in the micro-detection of magnesium and beryllium. J. V. DUBSKY, A. LANGER, and E. WAGNER (Mikrochem., 1937, 22, 108—116).—Metallic complex salts of

naphthazarin (I) and quinalizarin (II), on treatment with aq. NH_3 , are converted into ketimine complexes. Treatment with $(\text{CH}_3\cdot\text{NH}_2)_2$ similarly forms naphthazarin- and quinalizarin- $(\text{CH}_3\cdot\text{NH}_2)_2$ compounds. Salts are described of (I) with Cu (+ H_2O); of naphthazarinimine with Cu (+ $9\text{H}_2\text{O}$), Mg (+ $10\cdot5\text{H}_2\text{O}$), Ni (+ $10\cdot5\text{H}_2\text{O}$ + $0\cdot5\text{NH}_3$), Ca, and Ba; of quinalizarinimine with Cu (+ $7\text{H}_2\text{O}$), Ni [+Ni(OH) $_2$ + $10\text{H}_2\text{O}$]; of (I)- $(\text{CH}_3\cdot\text{NH}_2)_2$ with Ni (+ $21\text{H}_2\text{O}$) and Be (+ $4\text{H}_2\text{O}$); and of (II)- $(\text{CH}_3\cdot\text{NH}_2)_2$ with Ni [+ $(\text{CH}_3\cdot\text{NH}_2)_2$ + $5\text{H}_2\text{O}$], Cu (+ $10\text{H}_2\text{O}$), and Be [+Be(OH) $_2$ + $14\text{H}_2\text{O}$].

J. S. A.

Reactions in the solid state at high temperatures. XIV. Intermediate state in the formation of zinc aluminate from zinc oxide and aluminium oxide in the solid state. W. JANDER and K. BUNDE (Z. anorg. Chem., 1937, **231**, 345—364; cf. A., 1935, 944; 1936, 574).—The reaction between solid ZnO and Al_2O_3 at 400—1200° has been studied by X-ray measurements, catalytic action of the products on a $2\text{CO} + \text{O}_2$ mixture, their sorptive power for dyes, and solubility in NH_4Cl , HCl , and H_2SO_4 . There is initially a surface reaction which yields a thin layer of product, which ages, forming faulty crystals which finally transform into ideal crystals.

J. W. S.

Compounds of cyclic diamines with metallic salts. Zinc salts.—See A., II, 238.

Reaction of metal chlorides with phenol and β -naphthol.—See A., II, 188.

Synthesis under pressure of hydrated calcium silicates. (MLLE.) J. FORET (Compt. rend., 1937, 204, 977—979; cf. A., 1936, 1079).—At 130—300°, the silicates $x\text{CaO}\cdot\text{SiO}_2\cdot\text{aq.}$ ($x=2-4$) behave as $\text{CaO}\cdot\text{SiO}_2\cdot\text{aq.}$ in which the excess of CaO is absorbed. If x is <1 , free SiO_2 is present.

A. J. E. W.

Chemistry of sulphide phosphors. R. SCHENCK (Naturwiss., 1937, **25**, 260—269).—Reactions between heavy-metal sulphides and alkaline-earth sulphides in the prep. of phosphors have been studied. In the presence of alkaline-earth sulphide, heavy-metal sulphide is much more difficult to reduce by H_2 than when pure. This is due, in some cases, to the formation of complexes, e.g., SrSb_2S_4 , CaSb_2S_5 . These complexes are formed more easily by BaS and SrS than by CaS. The effect of light on such phosphors is to liberate electrons from the complex anions (which are thereby converted into the free radicals) which are taken up by the alkaline-earth cations. The emission of light from the phosphor is accompanied by the reverse change. A similar process can also occur in those cases where complex ions are not formed (e.g., $\text{CaS} + \text{Bi}_2\text{S}_3$; CaS and $\text{SrS} + \text{Ag}_2\text{S}$). Phosphors may be regarded as light "accumulators." The e.m.f. of an accumulator, dependent on the affinity of the reaction occurring within it, has its counterpart in the λ of the light emitted by the phosphor. Additive anionic and cationic effects are to be expected, as with galvanic cells. Where the reactions occurring in the phosphors are similar, such an approx. additive effect is found. This is also considered from the viewpoint of the affinity of the reactions.

A. J. M.

Calcium carbide. I. New crystalline phase of calcium carbide. H. H. FRANCK, M. A. BREDIG, and G. HOFFMANN [with A. FULDNER]. II. Preparation of pure calcium carbide and the discovery of a third crystalline phase of calcium carbide. H. H. FRANCK, M. A. BREDIG, and K. H. KOV (Z. anorg. Chem., 1937, **232**, 61—74, 75—111).—I. Commercial CaC_2 has normally a face-centred tetragonal structure (a 5.48, c 6.337 Å.) (CaC_2 I), but when it is formed in presence of CaCN_2 a form is produced of lower degree of symmetry (CaC_2 II), which is capable of absorbing $>15\%$ of CaCN_2 . CaC_2 II reacts with N_2 much more readily than CaC_2 I. SrC_2 prepared in presence of SrCN_2 is isomorphous with CaC_2 II, but no equiv. Ba compound could be obtained.

II. White CaC_2 (99.2%) has been prepared by heating pure CaCN_2 with or without C, first at 1130° and then for a short time at 1250—1300°. The product, CaC_2 III, differs in structure from CaC_2 I or II. When heated with CaS or Ca it is converted into CaC_2 I, whilst CaC_2 I passes into CaC_2 II when heated in a high vac. When heated with CaCN_2 , CaC_2 III passes into CaC_2 II. Formation of CaC_2 from CaO and C in a vac. occurs from about 1420°, even without fusion of the reactants. Below this temp. Ca vapour is formed. Neither SrC_2 nor BaC_2 could be obtained in forms isomorphous with CaC_2 III.

J. W. S.

Action of barium metal on barium oxide at high temperatures. M. SCHRIEL (Z. anorg. Chem., 1937, **231**, 313—326).—Contrary to the results of Guntz and Benoit (A., 1924, ii, 610), no suboxide could be produced by heating Ba with BaO at 1150°, and no development of heat could be detected. On evaporation, the Ba is relatively easily removed to a composition 2.5 Ba + 1 BaO, but further removal is slower. BaO appears to dissolve in molten Ba (20% at 725° and 45% at 1150°), but is redeposited on cooling.

J. W. S.

Fluorotetraborates, oxidotetraborates, and a new method of preparing boron fluoride. W. HELLRIEGEL (Ber., 1937, **70**, [B], 689—670).— KBF_4 and B_2O_3 at about 518° give *K fluorotetraborate*, $\text{KF}\cdot\text{B}_4\text{O}_6$, analogous to $\text{K}_2\text{O}\cdot\text{B}_4\text{O}_6$, and BF_3 which is conveniently obtained thus.

H. W.

Electrolytic dissociation processes. II. Friedel-Crafts reaction. F. FAIRBROTHER (J.C.S., 1937, 503—506).—Isotopic interchange experiments with AlCl_3 (containing radio-Cl) and AcCl and Bu^nCl , respectively, in C_6H_6 solution show that a complete interchange of Cl atoms occurs. An interchange of Cl takes place between AlCl_3 and AcCl in the absence of any solvent. The first stage in the Friedel-Crafts reaction is therefore the "ionisation" of the covalent aliphatic chloride under the influence of AlCl_3 , with formation of $[\text{AlCl}_4]^-$ and a carbonium ion.

A. J. M.

Substitution products of cryolite. A. H. NIELSEN (Z. anorg. Chem., 1937, **232**, 155—160).—By treating finely-divided Na_3AlF_6 with boiling aq. Ca, Sr, or Ba salts the compounds $\text{Ca}_3\text{Al}_2\text{F}_{12}\cdot 3\text{H}_2\text{O}$, $\text{Sr}_3\text{Al}_2\text{F}_{12}\cdot 3\text{H}_2\text{O}$, and $\text{Ba}_3\text{Al}_2\text{F}_{12}\cdot \text{H}_2\text{O}$ are formed. The optical properties of these compounds have been determined.

E. S. H.

Reaction of lanthanum oxide with ammonium iodide. R. C. YOUNG and J. L. HASTINGS (J. Amer. Chem. Soc., 1937, 59, 765—766).—The prep. of LaI_3 is described.
E. S. H.

Hydrogen effect in certain oxides. E. L. NICHOLS and C. L. STANFORD (J. Opt. Soc. Amer., 1936, 26, 91—98).—If black PrO_3 heated to about 1000° is subjected, at various stages of cooling, to the action of a jet of H_2 , the temp. rises 80 — 200° . CeO_2 and Gd_2O_3 give similar results; grey Pr_2O_3 is inert to H_2 , and when heated reverts to the black form. The activity of different oxides is compared in a series of normal heating curves for MgO , CaO , La_2O_3 , Nb_2O_5 , Al_2O_3 , SiO_2 , Gd_2O_3 , and Nd_2O_3 under specified conditions, and abnormalities due to departure from these conditions are discussed.
N. M. B.

Formation of graphite in the pyrolysis of organic compounds. W. HOOK (Iron and Steel Inst. Carnegie Schol. Mem., 1936, 25, 81—91).—The formation of C in the solid phase has been studied by investigating the carbonisation of glucose, sucrose, starch, lignin, gelatin, and glycine. A crit. temp. at which pronounced changes take place in the physical and chemical properties of the carbons exists in the neighbourhood of 700° . This crit. temp. is that at which liberation of metallic electrons occurs, or graphitisation commences. It is suggested that O and N may be bonded in a similar manner in the graphite lattice.
A. J. K.

Reaction of hydrogen cyanide with sulphuric and phosphoric acids. A. W. COBB and J. H. WALTON (J. Physical Chem., 1937, 41, 351—363).—An equimol. compound (I) of HCN and H_2SO_4 is formed by long interaction at 0° . With excess of H_2SO_4 the reaction is of the first order, but with increasing $[\text{HCN}]$ the reaction becomes one of zero order due to the autocatalytic effect of the reaction products. The reaction rate is unaffected by glass or light but is reduced in presence of H_2O . H_3PO_4 also forms an equimol. compound (II) at room temp., the reaction being of the first order since it occurs in the H_3PO_4 phase and $[\text{HCN}]$ can be considered const. (I) and (II) are insol. in most org. solvents and with H_2O form HCO_2NH_4 and H_2SO_4 or H_3PO_4 . With EtOH (I) forms $(\text{NH}_4)_2\text{SO}_4$ and HCO_2Et . The thermal decomp. of (I) and (II) has been studied in conc. acid solutions by measuring the CO evolved. The decomp. of (I) is a max. in 78—79% H_2SO_4 at 80 — 100° . The mechanism of the decomp. is discussed and the following formulæ are suggested: (I) $\text{O}:\text{CH}\cdot\text{NH}\cdot\text{SO}_3\text{H}$; (II) $\text{O}:\text{CH}\cdot\text{NH}\cdot\text{PO}(\text{OH})_2$.
C. R. H.

Formaldehyde from percarbonate. E. BAUR (Helv. Chim. Acta, 1937, 20, 398—401).—No CH_2O is obtained by reduction of K_2CO_4 (neutral or acid) cathodically or by HCO_2H or H_2O_2 . It is formed, however, by distilling K_2CO_3 or K_2CO_4 with H_2O_2 and PbO_2 (cf. A., 1923, i, 1271). No CH_2O is formed in absence of PbO_2 or prior to distillation with it present. The reaction is strongly endoenergetic, and it is concluded that it proceeds in each case through K_2CO_4 , and that distillation is necessary for isolation of the CH_2O because only very small traces exist in the mix-

ture at equilibrium. The catalytic action of the PbO_2 is not clear.
J. W. S., "

Reactions in the solid state, with special reference to the reactions between silica, sodium carbonate, calcium carbonate, and alumina. J. E. STANWORTH (J. Soc. Glass Tech., 1937, 21, 155—169T).—The various theories of solid reactions are critically discussed. Some of the theories cannot be distinguished in the early stages of the reaction, the mechanism of which can be determined only if the whole range of 0—100% decomp. is studied. It is not yet possible to describe completely the mechanism of the reaction between Na_2CO_3 , CaCO_3 , and SiO_2 , but it appears to consist of the decomp. of CaCO_3 in presence of Na_2CO_3 , followed by the interaction of SiO_2 and Na_2CO_3 .
J. A. S.

Silicon fluorochlorobromides. W. C. SCHUMB and H. H. ANDERSON (J. Amer. Chem. Soc., 1937, 59, 651—653).—The prep. of SiFClBr_2 and SiFCl_2Br is described. SiFClBr_2 has m.p. -99.3° , b.p. 59.5° , v.p. $\log P = 7.5669 - 1558/T$. SiFCl_2Br has m.p. -112.3° , b.p. 35.4° , v.p. $\log P = 7.0982 - 1301/T$. The compounds are hydrolysed completely by H_2O or moist air. New methods of preparing Si chlorobromides are described.
E. S. H.

Mechanism of the polymerisation of the phosphonitrile chlorides (PNCl_2)_x. A. M. DE FICQUELMONT (Compt. rend., 1937, 204, 867—869; cf. this vol., 226).—Equilibria exist between the lower members of the series. Polymerisation is probably due to the formation of monomeric PNCl_2 , which subsequently reacts with another member of the series, giving a higher polymeride.
A. J. E. W.

Tetrametaphosphates. P. BONNEMAN (Compt. rend., 1937, 204, 865—867; cf. A., 1904, ii, 26; 1924, ii, 856).—The prep. of $\text{Na}_4(\text{PO}_3)_4$ (I) is described and X-ray diffraction data for (I) and a hydrate are given. (I) gives $\text{Na}_3(\text{PO}_3)_3$ at $<500^\circ$, and $\text{Na}_5(\text{PO}_3)_5$ at the m.p.
A. J. E. W.

Deoxygenation of air and oxygen; properties of deoxygenated air and oxygen. E. BRINER and E. PERROTTET (Helv. Chim. Acta, 1937, 20, 451—457).—A gas containing very little O_3 , e.g., air containing about 10—60% of O_3 , can be effectively deoxygenated by heating at $<800^\circ$ but $<$ the temp. at which the equilibrium $[\text{O}_3]$ is of the order of the $[\text{O}_3]$ in the gas. Deoxygenated air and O_2 have no oxidising action on solutions of PrCHO in C_6H_{14} .
J. W. S.

Dichlorosulphuryl chlorosulphonate. G. P. LUTSCHINSKI and A. I. LICHATSCHIEVA (J. Gen. Chem. Russ., 1937, 7, 405—414).—M.p., d , η , and coeff. of expansion data for the system SO_3 — SO_2Cl_2 suggest formation of dichlorosulphuryl chlorosulphonate, m.p. -19.1° , which decomposes at the b.p. to yield SO_3 and SO_2Cl_2 .
R. T.

Behaviour of polonium in presence of sulphur dioxide. M. HAISSINSKY (J. Chim. phys., 1937, 34, 94—95).—The separation of Po from an aq. solution of Ta fluorosulphate when H_2SeO_3 is added and the Se then pptd. with NaHSO_3 (A., 1931, 1026) is due to adsorption of the Po by the pptd. Se.
R. C.

Introduction of radioactive halogens into organic molecules.—Sec A., II, 224.

(A) "The Evans effect occurs on impure iron and is due to active dusts" (Ronceray). U. R. EVANS. (B) A correction. P. RONCERAY (Bull. Soc. chim., 1937, [v], 4, 762—763, 763).—Polemical (cf. A., 1936, 1218). H. J. E.

Inner complex salts of iron and manganese.—See A., II, 247.

Metal carbonyls. XXIV. Mode of formation and metallic salt reactions of cobalt carbonyl hydride. W. HIEBER and H. SCHULTEN [in part with E. A. EHMANN]. XXV. Preparation and properties of free cobalt carbonyl hydride. W. HIEBER and H. SCHULTEN (Z. anorg. Chem., 1937, 232, 17—28, 29—38).—XXIV. $\text{Co}(\text{CO})_4\text{H}$ in aq. NH_3 (I) reacts with HgCl_2 and with AgNO_3 forming respectively, the compounds $[\text{Co}(\text{CO})_4]_2\text{Hg}$ and $[\text{Co}(\text{CO})_4]_2\text{Ag} \cdot 0.5\text{CO} \cdot 0.5\text{H}_2\text{O}$ (II), insol. in H_2O and dil. acids, but readily sol. in Et_2O , COMe_2 , and EtOH . Ammoniacal aq. Zn^{++} , Cd^{++} , and Cu^{++} solutions yield no ppt. on cooling with (I). With $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$ (I) gives a trace of the compound $[\text{Co}(\text{CO})_4]_2[\text{Co}(\text{NH}_3)_6]$, which is also formed in traces by the action of conc. NH_3 on $\text{Co}(\text{CO})_4$ at 0° and by action of gaseous NH_3 on $\text{Co}(\text{CO})_4$. With $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$, (I) yields traces of the compound $[\text{Co}(\text{CO})_4]_2[\text{Ni}(\text{NH}_3)_6]$. With $[\text{Co}(\text{Phthrl})_3]\text{Cl}_2$ and $[\text{Ni}(\text{Phthrl})_3]\text{Cl}_2$ (Phthrl = o-phenanthroline), (I) yields the compounds $[\text{Co}(\text{CO})_4]_2[\text{Co}(\text{Phthrl})_3]$ and $[\text{Co}(\text{CO})_4]_2[\text{Ni}(\text{Phthrl})_3]$, both insol. in H_2O . The formation of the orange-yellow colour of the latter compound is a good test for $\text{HCo}(\text{CO})_4$. A solution of (II) in COMe_2 with 2:2'-dipyridyl gives the insol. compound $\text{Co}(\text{CO})_4[\text{Ag}, \text{dipyridyl}]$, also formed from (I) and AgNO_3 , dipyridyl.

XXV. Pure $\text{HCo}(\text{CO})_4$ has been obtained by decomp. of the product obtained from $\text{Ba}(\text{OH})_2$ and $\text{Co}(\text{CO})_4$ with HPO_3 , distilling off the product, drying over P_2O_5 and condensing at -190° . It has m.p. -26.2° , yielding a bright yellow liquid which decomposes rapidly at -18° . Its v.p. over the range -37° to -29° indicates a latent heat of 18.25 kg.-cal. per mol., a val. which is compared with those for other carbonyls and carbonyl hydrides. J. W. S.

Interactions of cobalt chloride and ethylenediamine. H. D. K. DREW and N. H. PRATT (J.C.S., 1937, 506—510).— $(\text{CH}_2\text{NH}_2)_2$ with aq. CoCl_2 gives a ppt. of trans-hydroxo-aquo-bisethylenediaminocobaltic cobaltochloride (I) which affords the trans-plato salt with K_2PtCl_4 and trans-trichloroethylenediaminocobaltitethylenediamine hydrochloride with conc. HCl . The filtrate from (I) with conc. HCl gives trans-dichlorobisethylenediaminocobaltic cobaltochloride ($+\text{H}_2\text{O}$). The reactions and configurative relationships of these compounds are considered. J. G. A. G.

Werner complexes. Substitutions in optically active chlorinated complexes. J. P. MATHIEU (Bull. Soc. chim., 1937, [v], 4, 687—700; cf. A., 1936, 551).—The compound $[\text{Co en}_2(\text{H}_2\text{O})_2]\text{Cl}_3 \cdot 2\text{H}_2\text{O}$ was prepared and resolved, and its rotatory dispersion and circular dichroism studied. On dissolving active $[\text{Co en}_2\text{Cl}_2]\text{Cl}$ (I) in H_2O active $[\text{Co en}_2\text{Cl}(\text{H}_2\text{O})\text{Cl}_2]$ is

first formed, and it then racemises. Replacement of Cl by H_2O in solution leads to active ions in solution such as $[\text{Co en}_2\text{NH}_3\text{H}_2\text{O}]^{3+}$, $[\text{Co en}_2\text{NO}_2\text{H}_2\text{O}]^{++}$, $[\text{Co en}_2\text{NCSH}_2\text{O}]^{++}$ and $[\text{Co en}_2(\text{H}_2\text{O})_2]^{3+}$. The substitution of 2 NO_2 for 2 Cl in (I) by treatment with NO_2 results in only partial racemisation. Replacement of Cl by NCS , however, gave an inactive product. H. J. E.

Tridiaminocyclohexane salts of tervalent cobalt.—See A., II, 237.

Oxidation of nickel hydroxide by sodium persulphate in an alkaline medium. F. FRANÇOIS and (Mlle.) M. L. DELVAULLE (Compt. rend., 1937, 204, 1042—1044; cf. A., 1930, 700).—For low concns. of $\text{Na}_2\text{S}_2\text{O}_8$ (I), oxidation is quant., the product being Ni_2O_3 . With (I) in excess, the product has $\text{O}:\text{Ni} > 1.5$, this ratio increasing as $[\text{Na}_2\text{S}_2\text{O}_8]$ and $[\text{NaOH}]$ increase; the max. observed val. was 1.88.

A. J. E. W.

Preparation of nickel tetracarbonyl. K. MAYER and J. P. WIBAUT (Rec. trav. chim., 1937, 56, 356—358).— CO is passed over NiC_2O_4 (pptd. on infusorial earth and treated with H_2SO_4) heated first at 450° and then at 100° .

F. J. L.

Reaction between nickel carbonyl and thio-carbonyl chloride and the supposed polymeric carbon monosulphide of Dewar. K. MAYER and J. P. WIBAUT (Rec. trav. chim., 1937, 56, 359—364).—The amorphous brownish-black product of the reaction is of variable composition, containing covalent Cl ; $\text{C}:\text{S} = \sim 1:0.8\text{—}0.9$ (reaction in solvents) or 1.03 (vapour-phase reaction) (cf. A., 1910, ii, 1155).

F. J. L.

Action of hydrogen phosphide on solutions of nickel salts. R. SCHOLDER, A. APPEL, and H. L. HAKEN (Z. anorg. Chem., 1937, 232, 1—16).—The action of PH_3 on solutions of Ni salts yields generally alloy-like products containing 0.4—1 g.-atom of P to 1 g.-atom of Ni . Ppts. containing >0.67 g.-atom of P are obtained only from EtOH solutions. Under special conditions of concn., p_{H} , etc. pure Ni_5P_2 , Ni_2P , and NiP can be prepared.

J. W. S.

Halogeno-salts of rhodium. J. MEYER and K. HOEHNE (Z. anorg. Chem., 1937, 231, 372—382).—Previously described methods of preparing $\text{RhCl}_3 \cdot (\text{CH}_2\text{NH}_2\text{HCl})_2$ and $\text{RhCl}_3 \cdot 4\text{NH}_3\text{MeCl}$, have been confirmed. By the action of the appropriate base on the Rh salt in suitable acid solutions the following compounds have been prepared:

$\text{RhBr}_3 \cdot 2(\text{CH}_2\text{NH}_2\text{HBr})_2$; $4\text{RhI}_3 \cdot 3(\text{CH}_2\text{NH}_2\text{HI})_2$;
 $2\text{RhBr}_3 \cdot 3\text{NH}_3\text{MeBr}$; $\text{RhBr}_3 \cdot 4\text{NH}_3\text{MeCl}$;
 $\text{RhCl}_3 \cdot 4\text{NH}_3\text{MeBr}$; $\text{RhBr}_3 \cdot 2(\text{C}_6\text{H}_5\text{N}_2\text{H}_5\text{Br}_2)$ (from propylenediamine); $\text{RhCl}_3 \cdot 4\text{NH}_3\text{Me}_2\text{Br}$;
 $2\text{RhBr}_3 \cdot 3\text{NHMe}_2\text{Br}$; $2\text{RhBr}_3 \cdot 2\text{NH}_3\text{EtBr}$;
 $2\text{RhBr}_3 \cdot 3\text{NH}:(\text{NH}_2)_2\text{NH}_2\text{Br}$ (from guanidine);
 $2\text{RhBr}_3 \cdot 3\text{C}_6\text{H}_5\text{NHNHBr}$; $\text{RhBr}_3 \cdot 4\text{C}_6\text{H}_5\text{NHNHBr} \cdot 3\text{H}_2\text{O}$;
 $2\text{RhBr}_3 \cdot 3\text{C}_6\text{H}_5\text{Me}_2\text{NHNHBr}$ (from lutidine);
 $2\text{RhBr}_3 \cdot 3\text{C}_6\text{H}_5\text{Me}_2\text{NHNHBr}$ (from collidine);
 $2\text{RhBr}_3 \cdot 3\text{C}_6\text{H}_5\text{NHNHBr}$ (from quinoline);
 $4\text{RhBr}_3 \cdot 3\text{C}_{19}\text{H}_{29}\text{N}_2\text{H}_2\text{Br}$ (from cinchonine).

J. W. S.

Dipole measurements on isomeric platoc-complexes. III. K. A. JENSEN (Z. anorg. Chem., 1937, 231, 365—371; cf. A., 1936, 12;

this vol., 14).—The compounds $[\text{PtCl}_2(\text{PhNC})_2]$ and $[\text{PtCl}_2(\text{PhCN})_2]$ which are known only in one form both have dipole moments (μ) $12.5 \pm 1 \times 10^{-18}$ e.s.u., and are therefore *cis*-compounds. Action of Ph_2S (3.72 g.) in EtOH (25 c.c.) on K_2PtCl_4 (4.15 g.) in H_2O (50 c.c.) yields the compound *cis*- $[\text{PtCl}_2(\text{Ph}_2\text{S})_2]$ which is easily sol. in C_6H_6 and CHCl_3 , but very sparingly sol. in EtOH . It has m.p. 195° and $\mu = 5.5 \times 10^{-18}$ e.s.u. The less sol. compound produced by the action of Ph_2Se on K_2PtCl_4 is probably *cis*- $[\text{PtCl}_2(\text{Ph}_2\text{Se})_2]$. The action of Ph_2Te (2.8 g.) in EtOH (10 c.c.) on K_2PtCl_4 (2.08 g.) in H_2O (25 c.c.) yields the compound *cis*- $[\text{PtCl}_2(\text{Ph}_2\text{Te})_2]$ insol. in ordinary solvents, with m.p. about 200° with decomp. Action of Et_2Te (1.85 g.) on K_2PtCl_4 (2.1 g.) in H_2O (25 c.c.) yields the compound *cis*- $[\text{PtCl}_2(\text{Et}_2\text{Te})_2]$, readily sol. in CHCl_3 , sparingly sol. in C_6H_6 and cold EtOH , with $\mu = 6.0 + 0.5 \times 10^{-18}$ e.s.u. The results indicate that when compounds of this type are obtained in only one form, this is not always the *trans*-form, as has been generally supposed. J. W. S.

Sedimentometric analysis of suspensions. N. A. FIGUROVSKI (Zavod. Lab., 1936, 5, 829—840).—Known methods are reviewed. R. T.

Quantitative spectral analysis. E. BADUM and K. LEILICH (Angew. Chem., 1937, 50, 279—282).—The accuracy of measurements by the internal standard method is affected by variations in electrode distance and discharge voltage. Photo-electric control of the intensity of the spark during the exposure is recommended. Measurements should be preceded by a preliminary period of sparking, of < 3 min., to bring about constancy of sparking conditions. J. S. A.

Quantitative spectral analysis. H. KAISER (Metallwirts., 1937, 16, 301—306).—The determination of the degree of accuracy, relation to chemical analysis, and standardisation of methods of measurement are discussed in a general manner. C. E. H.

Recovery of 8-hydroxyquinoline. S. T. BALIUK (Zavod. Lab., 1936, 5, 878).—The filtrates after pptn. of cations with 8-hydroxyquinoline (I) are treated with CuSO_4 , the Cu salt of (I) is collected and dissolved in HCl , and Cu is pptd. by H_2S . The filtrate is made alkaline and steam-distilled; (I) is recovered from the distillate. R. T.

Conductometric titration of salts of weak bases (acids) with a dissociation constant greater than 10^{-4} . M. I. LAPSHIN (Zavod. Lab., 1936, 5, 1419—1422).—Straight lines are drawn through the first two and the last two points of titration curves; the equiv. point is at the point of intersection of the lines. The method is verified for titration of 0.0126 and 0.003N- NHMe_2HCl and of 0.00565N- NH_4Cl in 0.00315N- NHMe_2HCl with 0.1 and 0.5N-KOH. R. T.

Determination of p_H with electrolytic saturation of the electrode with gas. V. S. FINKEL-SCHTEIN and I. S. TARTAKOVSKI (Zavod. Lab., 1936, 5, 1417—1418).—The H electrode is a piece of platinised Pt foil saturated electrolytically (7—10 min.) with H_2 in the solution the p_H of which is to be measured. Trustworthy results are obtained

for 0.01—1N-acids and alkalis, and for phosphate buffers at p_H 6—8, but not for salts (Na_2SO_4), or in electro-titration. R. T.

Application of the glass electrode to measurement of hydrogen-ion concentration in alkaline solutions. J. POWNEY and D. O. JORDAN (J.S.C.I., 1937, 56, 133—137r).—Glass and H electrode potentials are compared. The anomalous behaviour of the glass electrode above p_H 9 caused by the presence of cations in the solution is confirmed. An empirical relationship is obtained connecting p_H , $[\text{Na}^+]$, and glass electrode correction factor at 22° , 40° , 60° , and 80° . The variation of p_H with concn. has been determined for several alkalis.

Titration errors in neutralisation. H. ARN-RELT (Svensk Kem. Tidskr., 1937, 49, 96—105).—A mathematical analysis is given. M. H. M. A.

Chromotropic acid as indicator in fluorescence titrations. E. A. KOCSIS and Z. VON S. NAGY (Z. anal. Chem., 1937, 108, 317—321).—The bluish-green fluorescence of 1:8:3:6-(OH) $_2\text{C}_{10}\text{H}_4(\text{SO}_3\text{H})_2$ (I) in neutral or acid solutions is extinguished at $p_H < 3-4$, enabling (I) to be used as indicator in strong-acid-base titrations. The concomitant colour change from red to yellow can be used for the titration of alkalis with acids, but not for the reverse action. J. S. A.

Absorption of hydrogen in liquid reagents. Solution for the determination of hydrogen in gas mixtures. D. T. BONNEY and W. J. HUFF (Ind. Eng. Chem. [Anal.], 1937, 9, 157—162).—The use of a reagent consisting of aq. Na anthraquinone-2:7-disulphonate and colloidal Pd, peptised by Na prot-albinate, is recommended for absorption of H_2 . The used reagent is regenerated by contact with O_2 or air. The application of the reagent to standard gas analysis practice is discussed. E. S. H.

Recent work on analytical problems. J. J. FOX (Oil and Col. Tr. J., 1937, 91, 993, 995).—Analytical methods in use at the Government Laboratory are described. H_2O in powders is determined by three methods: (1) determination of loss in wt. on drying at 100° , using specially designed desiccators and balances for quick work; (2) determination of dielectric const. (accurate to 0.25%); (3) distillation with heptane. Potentiometric titration and the addition of a third liquid to assist in the fractionation a binary liquid mixture by forming azeotropic mixtures are also referred to. D. R. D.

Determination of small quantities of heavy water. N. PERPEROT and F. SACHERL (J. Phys. Radium, 1935, [vii], 6, 319—322).—A modification of the method of Goldfinger *et al.* (A., 1934, 856) in which the equilibrium temp. of the micro-float is determined from the velocity of its motion through the mixture, is described. A. J. M.

Conductometric determination of water in salts. N. A. MALOV and V. M. VOLKIND (Zavod. Lab., 1936, 5, 945—947).—The resistance R of a column of finely powdered material under const. pressure is measured, when the H_2O content is given by KR^{-n} , where K and n are const. for a given sub-

stance. The abs. error is $\pm 0.1\%$ for $(\text{NH}_4)_2\text{SO}_4$, NaCl , and NH_4NO_3 , and 0.5% for $\text{Ca}(\text{OH})_2$. R. T.

Distillation method of determination of chlorides. V. M. ZVENIGORODSKAJA and R. G. GOTSCHNER (Zavod. Lab., 1937, 6, 44—47).—A mixture of the substance with 2.5 g. of KMnO_4 and 75 ml. of 20% H_2SO_4 is heated in a distilling flask until the vol. is reduced to 35 ml., collecting the distillate in a cooled flask containing 50 ml. of 2% KI , and the I liberated is titrated with $0.02N\text{-Na}_2\text{S}_2\text{O}_3$, or is determined colorimetrically. R. T.

Quinine sulphate as a fluorescent indicator for precipitation reactions. J. GRANT (Analyst, 1937, 62, 285—286).—If quinine sulphate is present, the end-point of the titration of AgNO_3 with NaCl or of a Zn salt with $\text{K}_4\text{Fe}(\text{CN})_6$ solution ($0.1\text{--}0.01N$) is indicated by a change from bright pale blue to dull purple in filtered ultra-violet light (cf. Fleck *et al.*, A., 1935, 315). Coloured solutions may be titrated in this way. J. G.

Successive titration of iodides and bromides in presence of large amounts of chlorides. S. K. TSCHIRKOV and M. S. SCHNEE (Zavod. Lab., 1937, 6, 40—44).—Traces of I^- ($\pm 0.02\%$) and Br^- ($\pm 0.15\%$) in aq. chlorides are titrated potentiometrically with NaOCl . R. T.

Colorimetric determination of fluorine in minerals. I. P. ALIMARIN (Zavod. Lab., 1936, 5, 1440—1442).—More exact results are obtained using Merwin's method (A., 1909, ii, 942) when neutralisation is effected with 30% H_2SO_4 in presence of *p*-nitrophenol. R. T.

Analysis of very dilute ozone. II. Determination of the ozone concentration in the air at Geneva. E. BRINER and E. PERROTTET (Helv. Chim. Acta, 1937, 20, 458—461; cf. this vol., 260).—By the method described previously, it has been found that Geneva air at 400 m. contains $7 \times 10^{-7} + 0.3 \times 10^{-7}\%$ of O_3 . J. W. S.

Micro-Carius determination of sulphur by the volumetric method. A. FRIEDRICH and F. MANDL (Mikrochem., 1937, 22, 14—33).—The material is heated with $\text{HNO}_3 + \text{NaNO}_3$ at $340\text{--}350^\circ$. The residue is evaporated down with 10% AcOH , and is dissolved in 2 c.c. of H_2O or, for small amounts of S , in a measured vol. (≥ 2 c.c.) of $0.02N\text{-H}_2\text{SO}_4$. The H_2SO_4 in solution is pptd. with an 8% solution of benzidine (Bzd) hydrochloride, saturated with $2\text{Bzd}\cdot\text{H}_2\text{SO}_4$. The ppt. is washed with saturated aq. $2\text{Bzd}\cdot\text{H}_2\text{SO}_4$, and is purified from co-pptd. $\text{Bzd}\cdot\text{HCl}$ by treatment with alcoholic AgNO_3 . KI is added to convert AgCl into AgI , the ppt. is dissolved in hot neutralised H_2O (Me-red), and is finally titrated with $0.02N\text{-NaOH}$. J. S. A.

Determination of sulphur in iron ores.—See B., 1937, 444.

Determination of sulphur in coal.—See B., 1937, 404.

Iodometric determination of sulphides in cyanide solutions. V. D. DJATSCHKOV and L. P. SAJZEVA (Z. anal. Chem., 1937, 108, 326—328).—The solution is acidified with HCl , and treated with

an excess of $0.1N\text{-I}$, whereby Na_2S alone is oxidised. The excess of I is then titrated back with $\text{Na}_2\text{S}_2\text{O}_3$. J. S. A.

Indirect titration of sulphate with barium chloride using sodium rhodizonate (or sodium tetrahydroxybenzoquinone) as indicator in solution. II. A. MUTSCHIN and R. POLLAK (Z. anal. Chem., 1937, 108, 309—316; cf. this vol., 148).—For the titration of SO_4^{2-} in presence of Zn or Cd , a considerable excess of BaCl_2 must be added. Fe , Al , and PO_4^{3-} must first be removed; NO_3^- is removed by evaporation with HCl . In presence of Ca , excess of BaCl_2 is added before adding COMe_2 , to avoid pptn. of CaSO_4 . $>1\%$ of NH_4^+ , Na^+ , K^+ , or Mg^{2+} hinders the indicator action and leads to low results. The derivation of an empirical titre for use in such titrations is discussed. Pptn. of BaSO_4 from solutions containing 10% of COMe_2 gives a macro-cryst., immediately filterable ppt. J. S. A.

Volumetric determination of sulphate ion. L. M. FRIDBERG (Zavod. Lab., 1936, 5, 872).—Bucherer's method (A., 1920, ii, 702) is recommended. R. T.

Polarographic determination of sulphate ion. J. P. GOCHSCHTEIN (Zavod. Lab., 1936, 5, 1444—1447).—The solution of sulphate in $0.01N\text{-NEt}_4\text{I}$ is adjusted to p_H 10 with LiOH , and titrated polarographically with $0.05\text{--}0.1N\text{-BaCl}_2$; NO_2^- , NO_3^- , K^+ , Na^+ , and traces of Fe^{III} do not interfere. R. T.

Determination of sulphate by Schtscherbatschev's method. A. V. VINOGRADOVA (Zavod. Lab., 1936, 5, 1382—1383).—The method (B., 1934, 831) is recommended. R. T.

Determination of sulphate ion. Micro-volumetric chromate method. G. G. MANOV and P. L. KIRK (Ind. Eng. Chem. [Anal.], 1937, 9, 198—200).—The sources of error have been investigated and modified procedure is recommended. E. S. H.

Determination of sulphites in the presence of nitrates and nitrites. J. G. SHERRATT (Analyst, 1937, 62, 267—271).—To 100 ml. of 5% $\text{N}_2\text{H}_4\cdot\text{H}_2\text{SO}_4$ solution are added in succession 20 ml. of 20% NaOH , the test sample, and 10 ml. of H_3PO_4 , and the mixture is distilled in a current of CO_2 in the Monier-Williams apparatus. The NO_3^- and NO_2^- are reduced, the SO_2 evolved being absorbed in H_2O_2 in the usual way. Applications to meat, pickles, bacon, and ham are described. J. G.

Standardisation of $0.1N$ -sodium thiosulphate solutions with potassium dichromate. E. TSCHIRCH (Pharm. Ztg., 1937, 82, 450—451).—Procedure is reviewed critically. The solution is best acidified with 20 c.c. of 25% HCl . J. S. A.

Quantitative drop analysis. VI. Total nitrogen by diffusion. G. T. BENTLEY and P. L. KIRK (Mikrochem., 1937, 21, 260—267).—A sample containing $0.001\text{--}0.03$ mg. of N is digested with H_2SO_4 in presence of CuSO_4 , and is clarified with H_2O_2 . The liquid is transferred to a diffusion flask, in which, when closed, it is mixed with an excess of NaOH at 50° . NH_3 diffuses into an excess of H_2SO_4 , contained in a suitably suspended cup, and the excess of acid is subsequently titrated back. J. S. A.

Determination of nitrogen in coal.—See B., 1937, 404.

Sources of error in detection of ammonia in drinking water by means of Nessler's reagent.—See B., 1937, 504.

Determination of small amounts of ammonia and other bases by the use of boric acid.—See A., III, 246.

Contact candles. II. Gas reactions with contact candles, especially the determination by gas analysis of nitrous oxide, nitric oxide, and methane with palladium, platinum, and rhodium. E. BIESALSKI and A. WACKER (Z. anorg. Chem., 1937, 232, 205—215; cf. A., 1933, 135).—The use of porous porcelain "candles," in which the catalyst is distributed, is demonstrated. E. S. H.

Rapid interferometric determination of nitrogen oxides.—See B., 1937, 436.

Rapid separate determination of nitrogen peroxide and nitric oxide in the gases of tower-process sulphuric acid factories.—See B., 1937, 434.

Reaction of diphenylamine with nitrates and nitrites. G. I. BARANNIKOV (J. Appl. Chem. Russ., 1937, 10, 394—395).—The reaction is given by active O, which may be produced when H_2SO_4 is added to natural H_2O ; the reaction is thus not sp., and should be applied for detection of NO_2' and NO_3' only under strictly standardised conditions. R. T.

Determination of yellow and red phosphorus and its oxidation products. T. A. KRIUKOVA (Zavod. Lab., 1937, 6, 47—51).—Yellow P is extracted with CS_2 , and determined as $\text{Mg}_2\text{P}_2\text{O}_7$. The residue is extracted with H_2O , and H_3PO_2 , H_3PO_3 , and H_3PO_4 are determined in the extract by known methods. The residue is boiled with N-AgNO_3 for 2 hr., and excess of AgNO_3 not reacting with P_4O is titrated. Red P is calc. by difference. R. T.

Photo-electric determination of phosphorus in estuarine waters. C. E. BRAMBEL and R. P. COWLES (Science, 1937, 85, 341—342).—A photo-electric colorimeter has been devised to measure the colour production by the Deniges method. Compared with distilled H_2O , the presence of salts decreases the amount of colour, but for salinities from 0.5 to 3% the effect of salts on the colour production is small. The salt effect on the determination of PO_4''' is covered by the use of calibration curves. CuSO_4 , FeSO_4 , and $\text{Fe}_2(\text{SO}_4)_3$ up to 5 times the amounts found in estuarine waters have no effect on the colour production in distilled H_2O or in artificial sea- H_2O . L. S. T.

Colorimetric determination of phosphorus in steel and iron.—See B., 1937, 447.

Separation of phosphoric acid in qualitative analysis. G. CHARLOT (Bull. Soc. chim., 1937, [v], 4, 676—682).— FeCl_3 in excess of the H_3PO_4 present is added to the acid solution from group II. NaOH is added until a slight ppt. remains; this is cleared with a drop of acid. $5M\text{-aq. NaNO}_2$ in excess of the amount to cause pptn. is added, and the

ppt. containing FePO_4 and AlPO_4 is filtered. The p_H is 4.0. The filtrate contains most of the Cr and is free from Fe. Co^{++} if present with K^+ or NH_4^+ must first be separated as sulphide by pptn. with H_2S and redissolution of the remaining sulphides in $2N\text{-HCl}$ saturated with H_2S . H. J. E.

Reaction of sparingly soluble salts with phosphoric, arsenic, and arsenious acids, and the application of these salts to separation of arsenic from phosphoric acid in qualitative analysis. A. D. VOROBIEVA (J. Appl. Chem. Russ., 1937, 10, 380—387).— AsO_4''' and PO_4''' , but not AsO_3''' , are removed from neutral solution by heating with PbCO_3 . The ppt., containing Pb, Fe^{III} , Al, and Cr^{III} phosphates, is further analysed by the usual methods. R. T.

Modification of the Bettendorf test as a confirmatory test for arsenic in qualitative analysis. J. CORNOG (J. Chem. Educ., 1937, 14, 130).—The As sulphide ppt. is heated with 10 ml. of $6M\text{-HClO}_4$ until the acid fumes strongly. 10 ml. of $12M\text{-HCl}$ and 5 ml. of $0.5M\text{-SnCl}_2$ are added, the mixture is heated to the b.p. and kept for 1 min. Should no brown coloration indicating As result, 1 ml. of a $0.025M\text{-HgCl}_2$ solution is added, the liquid is stirred, and kept for 10 min. L. S. T.

Determination of arsenic in ferrous and non-ferrous metals.—See B., 1937, 451.

Determination of small amounts of arsenic in iron and steel.—See B., 1937, 448.

Reduction of silver nitrate by arsine and its use for determining minimum amounts of arsenic. J. H. KREPILKA and J. FANTA (Coll. Czech. Chem. Comm., 1937, 9, 47—67).—Although AsH_3 is completely absorbed by neutral and ammoniacal AgNO_3 , the AsH_3 does not, in general, liberate stoichiometric proportions of Ag, and H_2 accompanying the AsH_3 also reduces AgNO_3 . Therefore, the process is untrustworthy for determining traces of AsH_3 by means of the nephelometric determination of the Ag liberated. J. G. A. G.

Determination of silicon in cast iron and steel.—See B., 1937, 444, 445, 447.

Determination of silicic acid in presence of organic colloids. P. N. GRIGORIEV and P. I. POSHARSKAJA (Zavod. Lab., 1936, 5, 1443—1444).—Rapid coagulation of SiO_2 is effected in presence of albumin, casein, or gelatin (1%), or agar-agar (0.2—0.5%). R. T.

Determination of silicic acid as pyridine silicomolybdate. A. K. BABKO (J. Appl. Chem. Russ., 1937, 10, 374—379).—0.1—0.5 g. of mineral is fused with 1—5 g. of KNaCO_3 , the melt extracted with H_2O , and the extract made up to a known vol. 10—30 ml. of solution, containing ≥ 5 mg. SiO_2 , are made alkaline, warmed to 50—60°, and 5 ml. of 10% $(\text{NH}_4)_2\text{MoO}_4$ are added, followed by 0.2 vol. of conc. HCl and 10 ml. of 10% $\text{C}_5\text{H}_5\text{N}$ in 20% HCl . The ppt. is collected after 2 min., washed with 1% $\text{C}_5\text{H}_5\text{N}$ in 2% HCl and H_2O , and boiled with dil. H_2SO_4 and Cd in a CO_2 atm. The resulting solution is titrated with

0.1*N*-KMnO₄ (1 ml. = 0.1667 mg. SiO₂). Should PO₄^{'''} be present, H₂C₂O₄ is added before pptn.

R. T.

Modification of colorimetric determination of silicic acid in presence of iron, phosphorus, and fluorine. I. P. ALIMARIN and V. S. ZVEREV (Mikrochem., 1937, 22, 89—101).—In presence of PO₄^{'''} and Fe, the slightly acid solution is neutralised with NaOAc + AcOH. 10 ml. of 10% NH₄ molybdate per 5 mg. of SiO₂ are added, and the solution is heated at 50—60°. An excess of conc. H₃PO₄ is added, decolorising the Fe and the PO₄-molybdate complex. Interference due to F⁻ is eliminated by adding AlCl₃, and the yellow silicomolybdate colour is colorimetrically determined.

J. S. A.

Determination of silicic acid in copper smelting slags.—See B., 1937, 448.

Determination of carbon dioxide in air.—See B., 1937, 504.

Analysis of carbonate-hydroxide-cyanide [cadmium-plating bath] mixtures.—See B., 1937, 453.

Determination of carbonate in "bicarbonate."—See B., 1937, 435.

Determination of small amounts of hydrocyanic acid. K. O. MOLLER and K. STEFANSSON (Biochem. Z., 1937, 290, 44—57).—The methods of Schulek (A., 1923, ii, 591) and Lang (A., 1925, ii, 1009) can be used to determine 0.02—20 mg. of HCN with accuracy. The optimal conditions for production of a colour on heating CN⁻ in alkaline picrate are investigated. Beer's law is followed only within very narrow limits of concn. Maintaining optimal conditions, HCN can be determined down to 10⁻⁵ g. both colorimetrically and photometrically. The presence of H₂S, COMe., and aldehydes leads to inaccuracy.

P. W. C.

Rapid determination of cyanide in cyanide melt.—See B., 1937, 435.

Micro-reaction for potassium. A. KNIGA (J. Appl. Chem. Russ., 1937, 10, 371—373).—Aq. NaI is added to freshly pptd. PbI₂ in amount slightly < that required completely to dissolve the PbI₂; the reagent so prepared gives characteristic needles with K⁺ (1.5 × 10⁻⁷ g.). Ions giving insol. ppts. with I⁻ interfere.

R. T.

Microchemical reaction for potassium. A. KNIGA (Kali, 1935, No. 7, 32—33).—The finely ground sample was fused on a Pt wire with Na₂CO₃, treated with HCl, put on a microscope glass, heated to remove excess of HCl, and treated with 1 drop of NaMnO₄. In 1—2 min. KMnO₄ crystals are visible through the microscope (sensitivity 0.04 mg. of K), Na, Mg, Ca, Sr, Ba, Zn, Al, Cd, Ni, Bi, and Cu did not interfere, but Mn, Co, Cr, I⁻, CN⁻, reducing anions, and org. matter did so. NH₄ salts, Rb, and Cs give the same reaction.

CH. ABS. (e)

Photometric determination of potassium. S. GOY (Angew. Chem., 1937, 50, 301—302).—K⁺ present in 0.0002*N* solution, may be determined by photometric measurement of the intensity of the red

doublet in the flame spectrum, a suitable light filter being interposed.

J. S. A.

Spectro-analytical determination of potassium. W. SCHURKNECHT (Angew. Chem., 1937, 50, 299—301).—A solution of the material is injected into a C₂H₂-air flame by means of a Lundegardh atomiser. The intensity of the 7664—7699 Å. K doublet is measured photometrically, a light filter of the superposed Schott glasses BG19, RG8, and BG3 being used to transmit only the desired region (7000—8500 Å.). 0.01% of K₂O may be so determined in presence of 1% of Na₂O or 0.2% of CaO.

J. S. A.

Micro-determination of rubidium and caesium in organic compounds.—See A., II, 268.

Determination of silver by the Gay Lussac method. A. WOGGINZ (Metall u. Erz, 1937, 34, 100—104).—A theoretical and mathematical discussion of the sources and magnitude of the possible errors in the determination of Ag by titration with NaCl.

A. R. P.

Microchemical contributions. XIV. L. ROSENTHALER (Mikrochem., 1937, 21, 215—223).—Ag may be detected by the characteristic habit of its compound with (CH₃)₆N₄, pptd. from HNO₃ solution. Cu is detected by the green colour given on shaking a Cu solution containing NaOAc with colophony in light petroleum or PhMe. A saturated solution of barbituric acid (I) in conc. HCl gives characteristic ppts. with PhCHO, anisaldehyde, cinnamaldehyde, vanillin, piperonal, and furfuraldehyde, but not with other aromatic aldehydes. Antipyrine (II), but not pyrimidine or isopropylantipyrine, gives a characteristic ppt. with CuSO₄ + KBr. Caffeic acid gives a cryst. ppt. with Ba(OH)₂. *p*-C₆H₄(NH₂)₂, but not *p*-tolylenediamine, 2:5-diaminoanisole, or *p*-NHPh-C₆H₄-NH₂, gives characteristic reactions with (NH₄)₂Co(CNS)₄ and with (NH₄)₂Hg(CNS)₄. The crystal forms of the ppts. given by K₃Co(CN)₆ with alypine, β-eucaine, eumydine, (CH₂)₆N₄, cocaine, nycaine, and percaine are described, and also ppts. of alypine, β-eucaine, diocaine, ephedrine, pantocaine, piperazine, and benzoylmorphine with nitrobarbituric acid. Reactions of the ·CO·NH· group, *e.g.*, in purines, are discussed with special reference to the pptn. of (I) with MgSO₄ + NH₄Cl, of saccharin with Pb(OAc)₂, of allantoin with Tl + aq. NH₃, of alloxan with Zwicker's reagent, and of succinimide with I + Na₂CO₃. 1 part of HNO₂ in 100 may be detected by the red colour produced on making alkaline a solution of rivanol + α-C₁₀H₇·OH containing HNO₂. Conversely, 0.01 mg. of α-C₁₀H₇·OH may be so detected.

J. S. A.

Formation of sparingly soluble substances in micro-analysis. J. V. DUBSKY, M. HRDLÍČKA, and V. ŠOUKAL (Mikrochem., 1937, 22, 119—120).—The sensitivity of reagents, *e.g.*, of *p*-dimethylamino-benzylidenetherhodanine for Ag, is discussed in relation to the detection of ions in the saturated solutions of salts (*e.g.*, Ag₂CrO₄, AgCl, AgBr) of progressively smaller solubility.

J. S. A.

Development of electro-drop analysis. H. FRITZ (Mikrochem., 1937, 22, 34—43; cf. A., 1935, 1473).—0.0002 mg. of Ag, in presence of NH₄⁺ and

NH₃ only, may be detected in a micro-drop of solution with certainty by spotting on a bright Cu sheet.

J. S. A.

Method of qualitative analysis without use of hydrogen sulphide. M. B. RANE and K. KONDAIAH (J. Indian Chem. Soc., 1937, 14, 46—50).—Ag, Sn, and Sb are pptd. by treatment with HCl and evaporation with HNO₃. Ba, Sr, and Pb are pptd. with (NH₄)₂SO₄. NH₃ + (NH₄)₃PO₄ are added to the filtrate, pptg. Al, Cr, Fe, Mn, Bi, Ca, and Mg. Co, Ni, Cu, and Cd are then pptd. with NaOH, leaving Zn, As, and the alkalis in solution. Separations within the groups so obtained follow normal lines.

J. S. A.

Attempt at quantitative analysis of silver-gold alloys by optical spectroscopy.—See B., 1937, 450.

Rapid determination of lime and magnesia. HORNKE (Tonind.-Ztg., 1937, 61, 311—312).—After removing Fe and Al and determining Ca volumetrically by KMnO₄, Mg is pptd. as MgNH₄PO₄. Pptn. is complete in 30 min., even with oxalate present, if carried out in boiling solution followed by cooling and shaking. The ppt. is washed with 10% aq. NH₃, suspended in H₂O, and titrated with HCl (Me-orange). The reaction is 2MgNH₄PO₄ + 4HCl = MgH₂(PO₄)₂ + MgCl₂ + 2NH₄Cl. As the ppt. dissolves slowly in HCl, a known excess may be added and titrated back with NaOH.

G. H. C.

Potentiometric determination of barium by means of ammonium dichromate. F. K. FISCHER (J. Appl. Chem. Russ., 1936, 9, 2269—2274).—The solution, containing 12—150 mg. of Ba, is diluted to 50 ml., 10 ml. of 10% NH₄OAc are added, and 6—15 ml. of 2% (NH₄)₂Cr₂O₇ are added to the boiling solution. The cooled solution is filtered, the ppt. is washed with 100 ml. of 1% NH₄OAc, and the filtrate + washings are electro-titrated with standard Fe^{II}. NH₄⁺, Mg⁺⁺, >0.002% Sr, and >0.02% Ca do not interfere.

R. T.

Determination of precipitates by density measurements. A. Z. JUROVSKI and A. P. SHADANOVSKAJA (J. Appl. Chem. Russ., 1936, 9, 2260—2268).—Determination of the difference in *d* of a suspension of BaSO₄ or of NH₄ phosphomolybdate, and of the medium alone, permits the evaluation of the amount of ppt. present; a method based on that of Popper (J.C.S., 1877, ii, 638; A., 1879, 480) is described.

R. T.

Iodometric determination of beryllium in complex fluorides. A. V. NOVOSELOVA and O. I. VOROBYEVA (J. Appl. Chem. Russ., 1937, 10, 360—363).—2 g. of KI, 20 ml. of 2—5% KIO₃, and 20 ml. of 20% CaCl₂ are added to 20 ml. of the fluoride solution (containing 9—18 mg. of Be), the solution is heated at 100° for 2 hr., and the I liberated is titrated with 0.02—0.1N-Na₂S₂O₃.

R. T.

Confirmatory tests for beryllium and gallium. A. A. BENEDETTI-PICHLER and W. F. SPIKES (Mikrochem., 1937, 21, 268—272).—Be is confirmed by evaporating down with AcOH. The residue is dissolved in H₂O, and made alkaline with aq. NH₃. On sublimation at 160°, characteristic crystals of Be₄O(OAc)₆ are obtained. Ga, in the absence of

other ions forming alums, is detected as its Cs alum by dissolving the Ga(OH)₃ ppt. in H₂SO₄, and adding CsCl containing some K alum.

J. S. A.

Determination of magnesium in presence of excess of ammonium oxalate. V. T. TSCHUJKO (J. Appl. Chem. Russ., 1937, 10, 364—366).—Low results are obtained when Mg is pptd. as MgNH₄PO₄ in presence of > a certain limiting [(NH₄)₂C₂O₄], which rises with the [Mg⁺⁺] of the solution.

R. T.

Volumetric determination of magnesium by the hydroxyquinoline-permanganate method. L. D. RASKIN and I. F. DROZD (Zavod. Lab., 1936, 5, 807—808).—0.5 g. of magnesite is dissolved in acid, Ca is pptd. as oxalate, and the filtrate + washings are diluted to 500 ml. Excess of HCl and 8—10 ml. of 3% 8-hydroxyquinoline are added to 250 ml. of the solution, which is shaken for 5 min., 5 ml. of aq. NH₃ are added, the solution is again shaken, boiled 1—2 min., cooled, and filtered. The ppt. is washed with 5% aq. NH₃, dissolved in 10% H₂SO₄ (200—250 ml.), and the solution is titrated with KMnO₄.

R. T.

Determination of magnesium by titration of magnesium ammonium phosphate. M. P. BABKIN and V. T. TSCHUJKO (Zavod. Lab., 1936, 5, 1512—1513).—The ppt. of MgNH₄PO₄ is washed with EtOH, dried at 105—110°, and dissolved in standard acid, excess of which is titrated.

R. T.

Determination of magnesium in presence of zinc by means of hydroxyquinoline. S. J. FAINEBERG and L. B. FLIGELMAN (Zavod. Lab., 1936, 5, 942—945).—Fe, Al, and Ca are pptd. in the usual way, and 8 ml. of 25% Na₂SO₃, 10 ml. of 30% NaOH, 23 ml. of 30% KCN, and H₂O to 300 ml. are added to the filtrate, which is heated to 70°, 7—10 ml. of 1.5% hydroxyquinoline in AcOH are added, the suspension is heated at 100° for 25 min., and filtered. The ppt. is washed with 1% NaOH, dissolved in dil. HCl, and H₂O is added to 120 ml. Standard KBrO₃-KBr is added, excess of which is determined iodometrically.

R. T.

Rapid analysis of zinc-sodium amalgams. H. A. LIEBHAFSKY (Ind. Eng. Chem. [Anal.], 1937, 9, 176).—Na is determined by adding excess of acid and titrating with standard alkali; Zn, which is not readily dissolved by acids when >0.01% is present, is determined by measuring the e.m.f. of the residual amalgam against a known conc. Zn amalgam. The accuracy is 2—5%.

E. S. H.

Volumetric determination of small amounts of zinc. A. G. BOSIN and S. S. JOFAN (J. Appl. Chem. Russ., 1937, 10, 367—370).—Zn (<0.6 mg.) is separated by Schoorl's reagent from group I—III cations, the ZnHg(CNS)₄ obtained is decomposed by aq. Na₂S (acid solution), the HgS pptd. is treated with standard I in CS₂, and excess of I is titrated with Na₂S₂O₃.

R. T.

Determination of zinc in cadmium.—See B., 1937, 449.

Rapid analysis of cadmium electrolyte.—See B., 1937, 453.

Determination of small amounts of lead by means of dibromohydroxyquinoline. II. A. M. ZANKO and A. J. BURSUK (*J. Appl. Chem. Russ.*, 1936, 9, 2297—2301; cf. A., 1936, 953).—0.1 g. of tartaric acid, aq. NH_3 to an alkaline reaction, H_2O to 50 ml., and COMe_2 to 10%, are added to the solution (containing ≤ 0.5 mg. Pb), followed by excess of 0.5% 5:7-dibromo-8-hydroxyquinoline in COMe_2 , at 50—60°. The ppt. is collected, washed with 4% aq. COMe_2 and H_2O , dried at 195—215°, and weighed. Sn and Sb do not interfere, but a special procedure is applied in presence of Cu. R. T.

Potentiometric determination of lead with sulphide solutions. G. I. MAHESHWARI and J. B. JHA (*J. Indian Chem. Soc.*, 1937, 14, 42—45).—A solution of Na_2S in a 0.2*N*- NaOAc + 0.2*N*- AcOH buffer solution is used. The reagent keeps well in H_2 . J. S. A.

Applicability of conductometric processes with visual observation in micro-chemical investigations. I. Titration of small amounts of lead, cadmium, copper, silver, and bismuth by means of hydrogen sulphide. H. IMMIG and G. JANDER. II. Titration of small amounts of chlorides by means of silver nitrate. III. Titration of small amounts of silver salts in presence of large amounts of lead salts by means of sodium chloride solution. G. JANDER and H. IMMIG (*Z. Elektrochem.*, 1937, 43, 207—211, 211—214, 214—215).—I. Conditions for the conductometric titration of Pb^{++} , Cd^{++} , Cu^{++} , Ag^+ , and Bi^{+++} by H_2S have been determined. The procedure is capable of determining to 0.001 mg. of the metals (except Bi, 0.01 mg.).

II. Conditions for the determination of 0.7—0.001 mg. of Cl' are described.

III. By suitable choice of conditions, the procedure is suitable for determining 1 mg. of Hg in presence of 500 mg. of Pb. E. S. H.

Electro-analytic determination of copper without the use of platinum electrodes. V. M. SCHALFEEV and A. P. BEZZABOTNIKOVA (*Zavod. Lab.*, 1936, 5, 1311—1313).—Equally good results are obtained with Ag as with Pt electrodes. Graphite anodes are suitable for solutions other than of nitrates, with a current of ≥ 1 amp. R. T.

Microchemical reaction for copper, using ammonium mercuric thiocyanate. I. M. KORENMAN and E. N. LUKASCHEVA (*Zavod. Lab.*, 1936, 5, 1438—1440).—Characteristic mixed crystals are formed when $(\text{NH}_4)_2\text{Hg}(\text{CNS})_4$ (I) is added to solutions containing Fe, Zn, Cd, Ni, or Pb, but not Co, Ag, or Bi. Excess of 10% aq. NH_3 is added to a drop of the solution, which is filtered, and 2 drops each of 20% $\text{Cd}(\text{NO}_3)_2$ and of (I) are added to 3 drops of filtrate; a violet ppt. indicates $\leq 5 \times 10^{-9}$ g. of Cu. R. T.

Coloroscopic investigations. T. A. THOMSON (*Mikrochem.*, 1937, 21, 209—214).— 10^{-10} — 10^{-9} g. of cations, present in 5×10^{-5} — 5×10^{-6} *N* solution, may be detected by means of colour reactions carried out in capillary tubes. 1—2 cm. length of solution and of reagent are introduced successively, and the

capillary is sealed at one end. The solutions are mixed by centrifuging, and examined axially with a microscope. Cu is detected with α -benzoinoxime; Cr (as CrO_4^{--}) with diphenylcarbazide or benzidine (I); Co with rubianic acid or 1:2- $\text{NO}\cdot\text{C}_{10}\text{H}_6\cdot\text{OH}$; Hg with diphenylcarbazone; and Mn with (I).

J. S. A.

Rapid determination of copper in copper sulphide ores and concentrates.—See B., 1937, 448.

Determination of copper in aluminium.—See B., 1937, 450.

Polarographic analysis of brass.—See B., 1937, 452.

Detection of mercurous, mercuric, and silver ions by drop reactions. E. A. KOCIS and G. GELEI (*Z. anorg. Chem.*, 1937, 232, 202—204).—The drop reaction with 1:8:3:6-(OH) $_2\text{C}_{10}\text{H}_4(\text{SO}_3\text{H})_2$ is suitable for the detection of 0.2 mg. of Hg_2^{++} , Hg^{++} , or Ag^+ . E. S. H.

Reagent for the detection of cerium. J. F. MILLER (*Ind. Eng. Chem. [Anal.]*, 1937, 9, 181—182).—Arsanilic acid gives a reddish-brown colour with Ce^{IV} solutions. The presence of F' , Zr, Co, or Cr interferes. Arsanilic acid can be used as an outside indicator in the titration of $\text{Ce}(\text{SO}_4)_3$.

E. S. H.

Electrometric analysis of cerium-lanthanum mixtures. J. A. ATANASIU (*Z. anal. Chem.*, 1937, 108, 329—333).—Ce + La are titrated together potentiometrically with $\text{K}_4\text{Fe}(\text{CN})_6$, being pptd. as $\text{KMFe}(\text{CN})_6$ ($\text{M} = \text{Ce}$ or La). Ce is determined alone in a second portion by oxidation to Ce^{IV} , which is then reduced by potentiometric titration with $\text{K}_4\text{Fe}(\text{CN})_6$. J. S. A.

Detection of traces of rare-earth elements. M. SERVIGNE (*Compt. rend.*, 1937, 204, 863—865; cf. this vol., 63).— 10^{-7} g. of rare earth in 1 g. of Ca tungstate or molybdate can be detected by observing the luminescence excited by an electrical discharge, at controlled temp. Mixtures of rare earths can be studied in some cases. A. J. E. W.

Micro-detection of aluminium, magnesium, and zinc with 1-aminoanthraquinone-2-carboxylic acid. J. V. DUBSKY and M. HRDLICKA (*Mikrochem.*, 1937, 22, 116—118).—The sol. K salt of the acid gives a red, non-sp. lake with Al (limiting concn., 1 in 220,000). Less sensitive pptns. are given with Mg and Zn. J. S. A.

Precipitation of alumina in the Kallauner-Matejka method of analysis. K. PFEFFERKORN and J. BODEN (*Sprechsaal*, 1937, 70, 171—172).—Stock's iodate-iodide method is recommended for determining Al in presence of SiO_2 , the ppt. being evaporated with HF before weighing. Pptn. with aq. NH_3 is not complete even on long keeping. G. H. C.

Direct determination of aluminium in aluminium-iron-manganese bronze.—See B., 1937, 448.

Spectrographic analysis of silumin.—See B., 1937, 451.

Permanganate micro-titration. M. V. ALEXEEVA (Zavod. Lab., 1936, 5, 872—873).—The excess of KMnO_4 present after titration, determined colorimetrically or iodometrically, is deducted from the result; under these conditions identical results are obtained for different vols. of titrated solution $[(\text{NH}_4)_2\text{C}_2\text{O}_4]$, at 50—90°. R. T.

Rapid determination of manganese in bronzes.—See B., 1937, 448.

Drop reaction for detection of rhenium. N. S. POLUEKTOV (J. Appl. Chem. Russ., 1936, 9, 2312—2315).—Reduction of $\text{TeO}_4^{''}$ by SnCl_2 is catalysed by ReO_4' . A drop of SnCl_2 in conc. HCl is added to a drop of solution, followed by a drop of 1% Na_2TeO_4 ; a black ppt. is obtained in presence of $\pm 2.5 \times 10^{-8}$ g. Re. V, W, As, Se, Os, and Mo interfere when present in > certain limiting concns. R. T.

Quantitative drop analysis. V. Determination of iron in simple and biological media. P. L. KIRK and G. T. BENTLEY (Mikrochem., 1937, 21, 250—259).—0.003—0.015 mg. of Fe in 1—2 drops of liquid is determined oxidimetrically. Biological fluids are ashed after addition of aq. NaOCl , and the ash is dissolved in 5% H_2SO_4 . The Fe^{+++} is reduced by shaking with 0.03 mg. of 3% Cd amalgam. An aliquot portion of the solution is oxidised with 0.01N-Ce $(\text{SO}_4)_2$, the excess of which is titrated back with 0.01N- FeSO_4 . J. S. A.

Rapid determination of iron in electroplating electrolytes.—See B., 1937, 453.

Rapid determination of sesquioxides in caustic soda.—See B., 1937, 435.

Potentiometric determination of iron and chromium in ferrochromium.—See B., 1937, 447.

Application of gaseous precipitants in gravimetric analysis. Separation of iron, aluminium, magnesium, and calcium. E. POZNER (J. Appl. Chem. Russ., 1936, 9, 2283—2296).—Pptn. of $\text{Fe}(\text{OH})_3$ and $\text{Al}(\text{OH})_3$ by gaseous NH_3 is recommended. In presence of Mg^{++} , CaC_2O_4 ppts. contain adsorbed MgC_2O_4 and other impurities; the best results are obtained by pptn. from acid solution by NH_3 , with permanganometric rather than gravimetric determination of the ppt. R. T.

Solutions for colorimetric standards. VIII. Army's series. C. T. KASLINE and M. G. MELLON (J. Amer. Pharm. Assoc., 1937, 26, 227—230).—Spectrophotometric curves and the limitations as colour standards of the series (Co-Fe-Cu, Co-Cr-Cu salts) are discussed. F. O. H.

Determination of nickel in steel.—See B., 1937, 447.

Comparison of methods for determination of small amounts of CrO_3 . Z. M. LEIBOV (J. Appl. Chem. Russ., 1937, 10, 388—393).—Direct colorimetric or iodometric determination of CrO_3 is recommended for highly coloured solutions. Where the colour due to CrO_3 is faint, diphenylcarbazine, p - $\text{C}_6\text{H}_4(\text{NH}_2)_2$, NH_2Ph , HCl , or amidol is added, and the colours are compared with standards (NO_2' interferes). R. T.

Diphenylsemicarbazide. C. F. MILLER (Chem. Analyst, 1936, 25, No. 1, 10—11).—The colorimetric determination of Cr and tests for Cd and Hg are described. The more or less fugitive colour reactions of Cu, Ag, Pb, Mg, Zn, Fe, Co, Ni, and Mn are given. CH. ABS. (c)

Electrolytic analysis of chromium ores.—See B., 1937, 449.

Determination of molybdenum in cast iron and steel.—See B., 1937, 444, 447.

Fractional reaction for tungsten, molybdenum, and vanadium. N. A. TANANAEV and P. F. VERESCHNIA (Zavod. Lab., 1936, 5, 864—866).—2—3 ml. of solution, containing $\text{MoO}_4^{''}$, $\text{WO}_4^{''}$, VO_3' , and all the ordinary anions and cations, are evaporated to dryness, the residue is ignited, extracted with hot 2—5N- H_2SO_4 , and the solution is filtered. A piece of Sn is placed on the ppt., which is moistened with HCl ; a blue coloration indicates presence of W. 2—3 drops of SnCl_2 and of aq. KCNS are added to 1 ml. of filtrate; a red coloration indicates Mo. 2—3 drops of NH_2Ph in conc. HCl are added to 1 ml. of the original solution; a blue coloration indicates V. R. T.

Separation of uranium, zirconium, and titanium from manganese, cobalt, and nickel by means of pyridine. E. A. OSTROUMOV (Ann. Chim. Analyt., 1937, [iii], 19, 89—93).—A solution, containing the metals as nitrates or chlorides, is exactly neutralised, and is heated at 100°. Ti, if present in large amount, is partly pptd. as basic salt. 20% aq. $\text{C}_5\text{H}_5\text{N}$ is added until the liquid is alkaline, thereby pptg. U, Zr, and Ti quantitatively. The separation requires only one pptn. J. S. A.

Determination of the activity of radioactive substances by the method of "thin layers." (Effect of thickness of substance.) M. FRANCIS (J. Phys. Radium, 1935, [vii], 6, 303—309).—The method of "thin layers" for determining the abs. activity of a granular substance containing an α -ray source gives erroneous results if the grains are large. The granular nature of U_3O_8 obtained by grinding in a mortar has been investigated. A. J. M.

Detection of small amounts of tin in ores by means of cacotheline.—See B., 1937, 449.

Determination of tin, stannous oxide, and stannic oxide in tablets.—See B., 1937, 496.

Application of a selenium photocolorimeter to chemical analysis. A. L. DAVIDOV and A. M. AVRUNINA (Zavod. Lab., 1936, 5, 927—931).—Determination of Ti and Mn by known methods, using a Se photocolorimeter, is described. R. T.

Sensitive reaction for germanium. N. S. POLUEKTOV (J. Appl. Chem. Russ., 1936, 9, 2302—2304).—A drop of solution is evaporated to dryness, 2—3 drops of hydroxynaphthacenequinonesulphonic acid in H_2SO_4 are added, and the solution is examined in blue light; a red coloration indicates 2.5×10^{-7} g. Ge. R. T.

Spectroscopic determination of germanium and beryllium in minerals and ores. A. RUSANOV and V. M. KOSTRIKIN (J. Appl. Chem. Russ., 1936,

9, 2305—2311).—Determination of Ge and Be from the emission spectra of mixtures of mineral with C-Pt is described. R. T.

Organic reagents capable of application to mineral analysis. I. 2 : 3 : 7-Trihydroxy-9-methyl-6-fluorone, special reagent for antimony cations. R. DUCKERT (Helv. Chim. Acta, 1937, 20, 362—367).—2 : 3 : 7-Trihydroxy-9-methyl-6-fluorone (I) is obtained by mixing 1 : 2 : 4- $\text{C}_6\text{H}_3(\text{OAc})_3$ (1 mol.) with MeCHO (1.25 mol.) dissolved in a mixture of 5—10% H_2SO_4 (1 part) and EtOH (5 parts), and heating for 1 hr. at 50—60°. H_2O is then added to ppt. (I), which is washed with H_2O and purified by dissolution in EtOH and repptn. with H_2O . At p_{H} 4 only Sb^{+++} and Sb^{++++} ions give bright red ppts. when treated with saturated solutions of (I) in EtOH , and it can be used as a sp. reagent for Sb. J. W. S.

Determination of gold. F. E. BEAMISH, J. J. RUSSELL, and J. SEATH (Ind. Eng. Chem. [Anal.], 1937, 9, 174—176).—Au is pptd. quantitatively from 1-2*N*-acid solutions, without occlusion of Pt or Pd, by 1% aq. quinol. The procedure is applicable to the determination of Au in alloys with Cu, Ni, and Zn. After pptn. of Au, Pd dimethylglyoxime can be pptd. directly, and Pt can be determined in the filtrate after heating the evaporated residue to destroy org. matter and digesting with aqua regia. E. S. H.

Spectrographic determination of platinum by the constant-pair method.—See B., 1937, 450.

Determination of m.p. by measuring conductivity. L. N. SERGEEV and M. S. SIMONOVA (Zavod. Lab., 1936, 5, 860—862).—The conductivity-temp. curves of metals exhibit a break at the m.p. R. T.

Calorimeter for measurements with liquids of high vapour pressure. K. L. WOLF and H. FRAHM (Z. physikal. Chem., 1937, 178, 411—419).—A metal-block calorimeter working isothermally and suitable for measuring sp. heats, and heats of reaction, mixing, dissolution, and dilution is described. R. C.

Demountable vacuum furnace. M. N. SAHA and A. N. TANDON (Proc. Nat. Acad. Sci. India, 1936, 6, 212—216).—A graphite tube furnace for temp. \rightarrow 2500° is described. J. S. A.

Increasing sensitivity of bimetal thermometers. J. B. DOWDEN (Product Eng., 1935, 6, 388—389).—A multiple-helix form of thermometer is described. CH. ABS. (e)

Thermostat with prolonged automatic regulation of low temperatures. L. J. KURTZ and V. G. VOANO (Zavod. Lab., 1937, 6, 107—108). R. T.

Self-operating temperature regulators.—See B., 1937, 399.

Blocking-layer photo-cell pyrometer. G. F. HUBING (J. Opt. Soc. Amer., 1936, 26, 260—261).—The construction and use of an improved portable instrument are described. N. M. B.

Ray-displacement refractometer for accurate work. K. PROSAD and R. P. GUPTA (Indian J. Physics, 1937, 11, 13—19).—Details of the construc-

tion of a refractometer specially suitable for thin transparent plates are given. The telescope of a spectrometer is replaced by a microscope having scale divisions in the eyepiece, and the collimator of the spectrometer is replaced by a const.-deviation spectroscope used as a monochromator. The accuracy of the instrument is discussed. W. R. A.

Use of refraction for determining mol. wt. M. M. SAMIGIN (J. Phys. Chem. Russ., 1936, 8, 845—848).—A knowledge of n and of the class of a compound is sometimes sufficient for determining its mol. wt. J. J. B.

Lamp for analytical balance. H. E. PHIPPS (J. Chem. Educ., 1937, 14, 107). L. S. T.

Ultramicroscopic observations with photosensitive crystals. IV. K. SCHAUUM and O. SCHELD (Z. wiss. Phot., 1937, 36, 121—140).—Ultramicroscopic investigations of binary crystal systems, and their sensitivity to light, are described. A. J. M.

Determination of absorption coefficients of the atmosphere. I. Method. J. DUCLAUX (J. Phys. Radium, 1935, [vii], 6, 323—328).—The method consists in comparing photographically the brilliance of a distant terrestrial object and that of the adjacent sky, using monochromatic light obtained by means of filters. A. J. M.

Photoelectric Tyndall meter. W. S. MUELLER (Food Res., 1937, 2, 51—54). E. C. S.

Numeration of X-ray diagrams in mass photography. A. A. KISELEV (Zavod. Lab., 1937, 6, 88—91).—Methods of marking objects of which X-ray photographs are to be taken are described. R. T.

Cameras for X-ray photography at low temperatures. E. E. FLINT and V. P. BUTUZOV (Zavod. Lab., 1937, 6, 91—95). R. T.

Determination of minute absorptions of light. A. VAN KREVELD and H. J. JURRIENS (Physica, 1937, 4, 297—304).—A photo-electric cell is used. Changes of 0.005% of the transmitted light could be observed. H. J. E.

Micrography of metals in ultra-violet light. J. SMILES and H. WRIGHTON (Proc. Roy. Soc., 1937, A, 158, 671—681).—A comparison of the results attainable by the use of a quartz objective of N.A. 1.25 designed for use with radiation of λ 2750 Å. and a visual light objective of N.A. 1.60. The images obtained with ultra-violet light show greater sharpness and detail. G. D. P.

Mask for printing Laue photographs. C. H. DWIGHT and H. KERSTEN (Rev. Sci. Instr., 1937, [ii], 8, 132—133; cf. A., 1935, 1340).—An improved method of preventing over-exposure of the central portion of a Laue photograph consists in rotating a piece of sector-shaped film between the photographic film and the light source. N. M. B.

Vacuum-cell luminescence microscope and its use in the study of luminescent materials. J. GALLUP (J. Opt. Soc. Amer., 1936, 26, 213—215).—A new type of instrument and its use in the examination and comparison of materials luminescent

under electron bombardment in vac. are described. The luminiscence of Ca silicates is discussed.

N. M. B.

Validity of the photographic reciprocity law for α -rays. R. N. WOLFE and T. R. WILKINS (J. Opt. Soc. Amer., 1936, 26, 105—110).—Validity is confirmed for a ratio of source intensities 171/1.

N. M. B.

Determination of concentrations by means of a liquid interferometer. N. A. FIGUROVSKI and K. A. POSPELOVA (Zavod. Lab., 1936, 5, 983—986).—Known methods are described.

R. T.

Quantitative spectrographic analysis. Increased accuracy in the logarithmic sector method. H. A. WILHELM (Ind. Eng. Chem. [Anal.], 1937, 9, 170—172).—A modified eyepiece, having internal comparison densities and an internal scale, is described.

E. S. H.

Hyperfine structure spectrograph. L. P. GRANATH and R. K. STRANATHAN (J. Opt. Soc. Amer., 1936, 26, 279—281).—The instrument described consists of a Fabry-Perot etalon and prism spectrograph built as a single unit.

N. M. B.

Application of punched-card equipment to the analysis of complex spectra. J. V. ATANASOFF and A. E. BRANDT (J. Opt. Soc. Amer., 1936, 26, 83—88).—A rapid and accurate tabulating and sorting machine method for the analysis of complex spectra into term vals. is described.

N. M. B.

Spectrometer for studies at high pressures. W. J. LYONS and F. E. POINDEXTER (J. Opt. Soc. Amer., 1936, 26, 146—148).—The instrument consists of a liquid prism confined between elliptical plate-glass windows 6 mm. thick fastened into the ends of a short rubber sack, the whole being contained in a strong pressure cylinder in which are cut narrow observation slits.

N. M. B.

Low-voltage source of ultra-violet continuum. A. E. SMITH and R. D. FOWLER (J. Opt. Soc. Amer., 1936, 26, 79—82).—A low-voltage H_2 discharge tube giving an intense continuous spectrum in the ultra-violet, and operating with currents as high as 20 amp., is described. Data for variations of intensity with pressure, current, and discharge voltage are tabulated.

N. M. B.

Monochromator for the near ultra-violet. F. BENFORD (J. Opt. Soc. Amer., 1936, 26, 99—104).—An instrument for max. monochromatic energy rather than spectral purity or λ accuracy, with fused quartz Pellin-Broca prisms, is described.

N. M. B.

Filters for the infra-red. R. B. BARNES and L. G. BONNER (J. Opt. Soc. Amer., 1936, 26, 428—433).—A simple filtering system of two simply constructed Se powder filters for obtaining a pure energy spectrum with a wire grating spectrometer in the region 40—130 μ is described. Transmission curves for 1—15 and 35—130 μ are given for cellulose nitrate, Se powder, MgO powder, camphor soot, quartz particles, Al-black, paraffin, and for MgO , LiF , KCl , and $NaCl$ melted into paraffin.

N. M. B.

Improvement of speculum gratings by the application of aluminium. A. B. FOCKE (J. Opt. Soc. Amer., 1936, 26, 235—237; cf. Strong, A., 1936, 399).—If the surface is coated with Al by evaporation, the time required to obtain a photograph of a spectrum is reduced by a factor which is the ratio of the reflexion coeff. of Al to that of the speculum metal. The speed of the original grating was increased for $\lambda\lambda$ 4077 (45%), 3341 (80%), and 2536 (170%).

N. M. B.

Interrupted arc for spectral analyses. J. H. McMILLEN and G. H. SCOTT (Rev. Sci. Instr., 1937, [ii], 8, 121—123).—To ensure uniform consumption of the sample, the latter is placed on the surface of a horizontal electrode which rotates on its own axis and also moves laterally into the discharge. Liquids are placed in a reservoir below the electrode and rotation causes continuous renewal of the surface layer. Motion of the electrodes is effected by motor-driven mechanism.

N. M. B.

Precision two-crystal X-ray spectrometer; improved method of equalising the spacing of worm-wheel teeth. J. W. M. DUMOND and D. MARLOW (Rev. Sci. Instr., 1937, [ii], 8, 112—121).—An instrument of wide applicability for radiation in the range vac. region—about 100 X. is described. An essential feature is the use of worm gears, and effective means of correcting teeth spacing by a lapping method is given.

N. M. B.

Photo-electric spectrophotometry. Apparatus for the ultra-violet and visible spectral regions: its construction, calibration, and application to chemical problems. T. R. HOGNESS, F. P. ZSCHEILE, jun., and A. E. SIDWELL, jun. (J. Physical Chem., 1937, 41, 379—415).—The instrument has an extended range in the ultra-violet to 2200 A., and by exposing solutions to 10^{-8} lumens, errors due to photochemical decomp. are minimised. A detailed description is given and the errors in the use of the instrument are discussed mathematically.

C. R. H.

Nephelometer-colorimeter with optical compensation. B. E. SEMETSKIN (J. Appl. Chem. Russ., 1936, 9, 2332—2337).

R. T.

Limitations of colorimetric analyses by present methods. E. L. ARMSTRONG and M. L. KUDER (J. Lab. Clin. Med., 1935, 21, 181—187).—Errors in the colorimetric methods for analysis of sugar, non-protein-N, urea-N, and uric acid are discussed. A new type of photo-electric colorimeter is described.

CH. ABS. (e)

Use of nephelometer for polydispersity analysis. S. I. CHARIN and L. G. SMIRNOVA (Kolloid. Shurn., 1936, 2, 543—548).—The gradual decrease of the turbidity of a sol allows its dispersity to be calc. Applications to soil and clay are mentioned.

J. J. B.

Continuous determination of turbidity and coloration. G. S. ALEXANDROVITSCH (Zavod. Lab., 1936, 5, 875—877).—A photo-electric cell is described.

R. T.

Apparatus for the measurement of low concentrations of radon. M. H. GARRIGUE (J. Phys.

Radium, 1936, [vii], 7, 107—109).—The construction of a portable apparatus is described. O. D. S.

Method of measuring powerful sources of α -rays. R. GARNIER (J. Phys. Radium, 1936, [vii], 7, 110—112).—The intensity of the rays is determined by the measurement, by means of a photo-electric cell, of the fluorescence produced on a ZnS screen. O. D. S.

New method of focussing beams of rapid positive ions. Application to mass spectrography. L. CARTAN (J. Phys. Radium, 1937, [vii], 8, 111—120).—A special electrostatic gauze "lens" is described which is capable of focussing a beam of heavy particles with high energy. 1000—5000 volts applied to the lens will focus beams of 10^6 e.v. energy. The use of the lens in a mass spectrograph enables a more intense photograph to be obtained. Changing the sign of the potential of the lens changes it from convergent to divergent. A. J. M.

Technique of electrolytic conductivity measurement. F. ENDER (Z. Elektrochem., 1937, 43, 217—233).—The theoretical background of conductivity measurements is discussed, with special reference to accuracy. E. S. H.

Simple micro-electrode for determining p_{H} and E_h . W. A. DOREMAN (Protoplasma, 1936, 25, 465—468). M. A. B.

Latent impurities in electrodes used for spectrographic research. W. A. ROACH (Nature, 1937, 139, 547).—Possible impurities in the electrodes are eliminated by the prep. of small electrodes from the plant material itself by suitable treatment and carbonisation. The spectrogram thus obtainable is compared with that prepared from filter-paper to which pure salts have been added. L. S. T.

Impurities in electrodes for spectrometer work. J. G. MALTBY (Chem. and Ind., 1937, 220).—The invariable occurrence of metallic impurities in graphite electrodes is confirmed; it may be avoided only by using pure C electrodes. J. S. A.

Glass electrode. G. HAUGAARD (Tids. Kjemi, 1937, 17, 53—57).—Apparatus is described. Asymmetrical potentials have been measured and their significance is discussed. M. H. M. A.

Vapour-cooled electrodes. O. H. SCHMITT (Rev. Sci. Instr., 1937, [ii], 8, 131).—Two designs of electrode, in which a small quantity of liquid trapped within the electrode is vaporised with absorption of heat, recondenses on a large air-cooled surface, and runs back into the electrode, are described.

Electron tube and instrument for use with the glass electrode, and a rugged type of glass electrode. L. D. GOODHUE (Iowa State Coll. J. Sci., 1935, 10, No. 1, 7—15).—The apparatus is described. CH. ABS. (e)

Measurement of hydrogen-ion concentration with a glass electrode using a lamp voltmeter. E. C. GELGREN and T. M. MENSCHIKOVA (Zavod. Lab., 1937, 6, 109—110).—Apparatus is described. R. T.

Application of the mercury cathode to determination of aluminium. S. P. MOLTSCHANOV

(Zavod. Lab., 1936, 5, 1518—1519).—Apparatus is described. R. T.

Simplified potentiometric titration. A. K. BABKO (Zavod. Lab., 1936, 5, 1387—1388).—Apparatus is described. R. T.

Dielectric constants. II. F. PAVELKA and J. KIRIGIN-MARDEGANI (Mikrochem., 1937, 21, 273—297).—A review of dielectric const. measurements, and their analytical applications. J. S. A.

Influence of time of running and of drainage on measurements with burettes. V. RANK (Mikrochem., 1937, 21, 231—244).—The magnitude of drainage errors is discussed. J. S. A.

Micro-burette.—See B., 1937, 427.

Apparatus for reducing and titrating solutions without access of air. C. J. RABINOVITSCH (Zavod. Lab., 1936, 5, 1390—1391). R. T.

Constructional devices for increasing accuracy of titration with large volumes. R. I. ALEXEEV (Zavod. Lab., 1937, 6, 126).—No advantage is gained by titration involving the use of a macro-burette for the bulk of the standard solution, and of a micro-burette when approaching the end-point. R. T.

Automatic pipette for sedimentation analysis. E. O. HOFMAN (Kolloid. Shurn., 1937, 3, 87—89). J. J. B.

Modified Hempel gas analysis apparatus. A. R. HERSHBERGER (J. Chem. Educ., 1937, 14, 139—140). L. S. T.

Modified Bone and Wheeler gas-analysis apparatus.—See B., 1937, 405.

Foaming analysis. II. W. OSTWALD and A. SIEHR (Kolloid-Z., 1937, 79, 11—15; cf. A., 1936, 1080).—Improved apparatus and technique is described, suitable for solutions which form "solid" films (e.g., K stearate, albumin). F. L. U.

New series of buffer mixtures covering the p_{H} range 1—6. W. L. GERMAN and A. I. VOGEL (Analyst, 1937, 62, 271—280).—Binary mixtures in various proportions of standard solutions of $p\text{-C}_6\text{H}_4\text{Me}\cdot\text{SO}_3\text{H}$, $\text{CH}_2\text{Ph}\cdot\text{CO}_2\text{H}$, and succinic acid (I), each with its corresponding Na salt [Na_2 salt of (I)] are used for the ranges 1.3—3.3, 2.8—4.4, 3.35—5.1 and 4.8—6.3, respectively. Max. Van Slyke buffer capacities are 0.21, 0.0056, 0.0036, and 0.004, respectively. Advantages are cheapness, stability, ease of purification (methods are described) and of checking the purity, and convenience of prep. of the solutions. The data were checked electrometrically. J. G.

Air-driven centrifuge for semi-micro qualitative analysis. W. C. VOSBURGH and J. H. SAYLOR (J. Chem. Educ., 1937, 14, 142). L. S. T.

Observation of ultracentrifugal sedimentation by the Toepler "Schlieren" method. A. TISELIUS, K. O. PEDERSEN, and I. B. ERIKSSON-QUENSEL (Nature, 1937, 139, 546).—The no. of components and their sedimentation velocities can be directly observed during sedimentation. Approx. amounts also can be estimated. Sedimentation pictures of haemocyanin and of a pathological serum are given. L. S. T.

Air turbine centrifuge. H. W. BEAMS (J. Marine Biol. Assoc., 1937, 21, 571—588).—An air turbine centrifuge capable of developing a centrifugal force from 10,000 to 500,000 times $>$ gravity is described. Temp. in the centrifuge is approx. atm., and the apparatus is cheap to construct. A modification in which the turbine drives the centrifuge rotor in vac., and is capable of giving a force $>10^6g$, is described. As the centrifuge chamber is thermally insulated, convection currents are avoided. A microscope centrifuge in which materials can be observed under the microscope while being centrifuged is described.

A. J. M.

Temporary marking of chemical glassware. A. L. BACHARACH (Analyst, 1937, 62, 286).—Lead-pencil writing on etched or sand-blasted areas is best removed by an ordinary rubber eraser. J. G.

Apparatus for rapid determination of moisture by the carbide method. L. M. JOLSON (Z. anal. Chem., 1937, 108, 321—325).—A volumeter for determining the vol. of C_2H_2 liberated is described.

J. S. A.

Preservation of starch indicator. B. NAIMAN (J. Chem. Educ., 1937, 14, 138).—Starch solution prepared with HgI_2 as preservative gave satisfactory results after being stored in glass-stoppered bottles for 8 years.

L. S. T.

Apparent molecular volume of dissolved electrolytes. III. Dilatometer for determination of variation with concentration of apparent and partial molecular volumes. W. GEFFCKEN, A. KRUIS, and L. SOLANA (Z. physikal. Chem., 1937, B, 35, 317—330; cf. A., 1934, 252).—An apparatus capable of determining with a precision of 2×10^{-4} c.c. the vol. change occurring when two liquids are mixed in stages has been used to measure the apparent mol. vol. of 0.2—6.6*N*-NaBr.

R. C.

Bulb for combustion of gases for their analysis. V. L. MATSCHKARIN (Zavod. Lab., 1936, 5, 1520).—Cracking of glass due to rapid expansion of Pt wire embedded in it is avoided by making electrical contact through Hg, which cools the wire.

R. T.

Automatic regulation of rate of flow of gases. M. M. FAINBERG (Zavod. Lab., 1936, 5, 1005—1006).—Apparatus is described.

R. T.

Automatic water regulator. H. R. LUTHERA (J. Sci. Instr., 1937, 14, 141).—The level in an open-air experimental pit is kept const. by means of a Hg seal

in a wooden float which controls the inflow from a pipe.

N. M. B.

Taking small samples of gas. J. I. PALI (Zavod. Lab., 1936, 5, 1386).—Apparatus is described.

R. T.

Vessels for the storage of gases and liquids. J. SENDROY, jun. (Ind. Eng. Chem. [Anal.], 1937, 9, 190—191).

E. S. H.

Mercury seal for stirrers. L. H. BRIGGS (Ind. Eng. Chem. [Anal.], 1937, 9, 168).—Modified apparatus is described.

E. S. H.

Gas-tight laboratory stirring device for pasty materials. A. H. MAUDE (Ind. Eng. Chem. [Anal.], 1937, 9, 196).

E. S. H.

Stirring under vacuum. S. H. BERTRAM (Chem. Weekblad, 1937, 34, 287).—An apparatus is described in which the glass stirrer shaft passes through a glass sleeve fitted into the flask stopper, a vac.-tight connexion being effected by a short length of rubber pressure tubing fitting around the shaft and secured over the top of the sleeve. The joint may be lubricated with glycerol.

S. C.

Vacuum gauge for leak hunting. J. B. H. KUPER (Rev. Sci. Instr., 1937, [ii], 8, 131—132).—A circuit is described in which a 40-watt tubulated light bulb in an a.c. bridge with loudspeaker acts as a gauge.

N. M. B.

High-vacuum technique. J. E. ROSE (Rev. Sci. Instr., 1937, [ii], 8, 130).—A simplified leak-proof form of Du Mond high-vac. valve (cf. *ibid.*, 1935, [ii], 6, 285) and a leak-proof joint, which obviates cracking of cement by expansion and contraction, are described.

N. M. B.

Sensitive adaptation of the spoon gauge. A. LEWIS and D. W. G. STYLE (Nature, 1937, 139, 631).—The incorporation of a special form of bifilar suspension permits the measurement of pressure differences of the order 4×10^{-5} mm. of Hg.

L. S. T.

Viscosimeter suitable for materials of high viscosity.—See B., 1937, 400.

Sensitive quartz spiral-spring balance. C. J. DIPPEL (Chem. Weekblad, 1937, 34, 317).—Using a quartz spiral-spring balance with an accuracy of 0.01 mg.-atom, the absorption energy of I on CaF_2 at 20° and 40° is shown to be about 13,000 g.-cal. per mol. The desorption isotherms show very definite hysteresis.

S. C.

Geochemistry.

Thermoluminescence of crystallophyllian and eruptive rocks from Algeria. L. ROYER (Compt. rend., 1937, 204, 602—604).—The crystallophyllian rocks show strong thermoluminescence, attributed to the presence of orthoclase. Eruptive rocks are weakly thermoluminescent.

A. J. E. W.

Kaolin and clay. W. L. DE KEYSER (Natuurwetensch. Tijds., 1937, 19, 91—105).—Kaolin loses 2/3 of its combined H_2O when heated in a vac. over P_2O_5 at 350° for 200 hr. and is completely dehydrated at 1000° (loss 15.1%). Thermal analysis shows a

definite decomp. point at 500° but no inflexion was observed at 650°. Kaolins from Zettlitz and "Les Eyzies" were identical in their behaviour.

S. C.

Composition and nature of organic compounds in gasiferous clays of the Melitopol district. J. V. GRETSCHNI (Ukrain. Chem. J., 1937, 12, 64—72).—The org. matter has a composition corresponding with that of humin coal. The origin of the deposits is discussed.

R. T.

Alteration of spodumene to kaolinite in the Etta mine. G. M. SCHWARTZ (Amer. J. Sci., 1937,

[v], 33, 303—307).—In one part of the mine the large crystals of spodumene are in part or completely altered to kaolinite (instead of to "killinite"; A., 1926, 379), preserving the outline and cleavage of the original mineral. Analysis shows loss of Li_2O and SiO_2 and gain of H_2O , with a porosity of about 5%.

L. J. S.

Recently discovered kaolin-sandstone occurrence in the crystalline limestone of Pargas-Ål Island, Abo, S.W. Finland. H. HAUSEN (Acta Acad. Abo., Math. Phys., 1934, 8, No. 1, 59 pp.).

CH. ABS. (e)

Geochemical constants of iron. A. E. FERSMAN (Uspechi Chim., 1935, 4, 731—755).—A discussion.

CH. ABS. (e)

Iron ores of the Middleback Ranges, S. Australia. A. B. EDWARDS (Proc. Austral. Inst. Min. Met., 1936, No. 102, 155—207).—The geology and mineralogy of 12 bodies of bedded haematite (I) ore which occur in synclinal structures associated with aluminous schists and banded (I)-quartzites at various points in the Eyre Peninsula are discussed. Closely associated with the massive ores are schistose and blue powder ores derived from the leaching of (I)-rich quartzites. The (I) appears to have been produced by alteration of magnetite by the action of descending surface-waters which have sometimes carried Mn in solution; this has in places been deposited in a gel form as psilomelane, frequently rich in Fe, and in other places it has crystallised out as veins of pyrolusite, sometimes with braunite and manganite. The Fe in the gel has also crystallised as supergene magnetite; the limonite also present is apparently an alteration product of the original magnetite. The deposits are similar even in detail to those of Lake Superior, Brazil, India, and other localities, and belong to the Mosquito Series of the Pre-Cambrian period.

A. R. P.

Bituminous earths from the Kahuzi. A. SCHÖEP (Natuurwetensch. Tijds., 1937, 19, 83—85).—Black earth from the top of the Kahuzi volcano contains 70% of a protobitumen, m.p. 75—95°, acid val. 60, sap. val. 125, of vegetable origin. S. C.

Blackish-grey chrysocolla. L. DE LEENHEER (Natuurwetensch. Tijds., 1937, 19, 86—90).—Two samples of blackish-grey chrysocolla from Luishia and Star of the Congo, respectively, had the following compositions: SiO_2 33.84, 33.08; CuO 37.05, 38.38; H_2O 18.55, 24.21; Fe_2O_3 3.94, 4.24; Co_2O_3 5.74, 0%. They were identical with katangite and the colour was not due to Co. S. C.

Petrographic and chemical study of the region of the valleys Neagra and Haïta. O. NICHITA (Ann. Sci. Univ. Jassy, 1935, 20, 197—314).—An extensive survey is given of the rocks of the Calimani mountains and the cycles of eruption are discussed.

R. S. B.

Red and yellow Tschubarovka ochres. I. J. MIKEI, I. A. BRODSKA, and A. T. TSCHORNI (Ukrain. Chem. J., 1937, 12, 73—76).—Analytical data are given. R. T.

Change of anorthite into a variety of thomsonite containing calcium. (MILLER) S. CAILLERE (Compt. rend., 1937, 204, 785—786). A. J. E. W.

Dissociation of zircon. H. GEORGE and R. LAMBERT (Compt. rend., 1937, 204, 688—689).—Fusion followed by rapid cooling causes complete dissociation of zircon into cryst. ZrO_2 and vitreous SiO_2 . The Debye-Scherrer diagram is unchanged by the process. Ignition at temp. < the m.p. causes partial dissociation. A. J. E. W.

Crystalline structure of laurionite. S. GOLDSZTAUB (Compt. rend., 1937, 204, 702—703).—The unit cell contains 4 mols. of $\text{Pb}(\text{OH})\text{Cl}$, and has a 7.1, b 9.7, c 4.05 Å.; space-group $V_1^h Pnam$. At. parameters are given; they show a close analogy to those of matlockite. A. J. E. W.

Genesis of some sulphur deposits of the U.S.S.R. P. M. MUZAIJEV (Econ. Geol., 1937, 32, 69—103).—The Knibvshev, Sukeievo, Chekur-Koyash, Kazbek, Gumur, and Kamchatka S deposits are described. The reduction of SO_4^{--} under natural conditions probably occurs biochemically. The S of the bedded deposits (first three mentioned above) is syngenetic. L. S. T.

Mineralogical composition and properties of Tichvin bauxites. A. N. VARSCHAVSKI and G. I. JASINSKAJA (J. Appl. Chem. Russ., 1937, 10, 69—81).— Fe_2O_3 is quantitatively extracted from bauxites dried at 130° by boiling with 20% HCl for 1 hr., whilst extraction of Al_2O_3 varies from 13 to 32% (1 hr.) and from 36.3 to 84.4% (8 hr. extraction), for different bauxites. 100% extraction (1—4 hr.) of Al_2O_3 and Fe_2O_3 is obtained with bauxites heated at 500—700°; at 800—1000° the yields fall rapidly. The % of TiO_2 extracted rises with temp. over the whole range. The kaolinite, diaspor, hydrargillite, and calcite contents of four bauxites are given.

R. T.

Lead-bearing tourmaline from the Maly Khin-gan range. A. A. LEBEDEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 127—128).—The analysis of tourmaline containing 1.25% of PbS is given.

O. D. S.

Review of the problems of the Sudbury [nickel] eruptive. T. C. PHEMISTER (J. Geol., 1937, 45, 1—47).—Petrological. Chemical analyses are recorded and chemical relationships discussed.

L. S. T.

Occurrence of nickel in the biotite shales of the Ural emerald mines and of other emerald deposits. K. K. MATVEEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 123—126).—Ni contents of from 0.03 to 0.09% have been found by analysis in (unrepresentative) samples of biotite shale from Ural, Habachtal (Tyrol), and the Somerset mine (Transvaal).

O. D. S.

Composition and paragenesis of biotites of the Carsphairn igneous complex. W. A. DEER (Min. Mag., 1937, 24, 495—502).—Biotites isolated from granite, tonalite, and a hornblende hybrid are analysed, and their composition is compared with that of the enclosing rock. In more acid rocks the biotite shows an increasing $\text{FeO}:\text{MgO}$ ratio, and a decreasing $\text{RO}:\text{R}_2\text{O}_3$ ratio. The chemical formula of biotite is discussed in relation to its crystal structure.

L. J. S.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

JULY, 1937.

Mutual excitation of hydrogen and argon by atomic impact. E. LUTZE (*Z. Physik*, 1937, **105**, 445—459).—A metallic discharge tube for the production of positive rays in rarefied gases is described. With mixed H_2 and A in the tube the spectrum produced by collisions between charged and uncharged atoms was investigated for discharge voltages between 0.2 and 30 kv. (velocity range $0.1\text{--}2.5 \times 10^8$ cm. per sec.). From 0.2 to 1 kv. only the H spectrum was excited; above 1 kv. lines of the A I spectrum appeared, followed by the A II spectrum above 2 kv. As the voltage rose intensities of A I and A II lines increased rapidly and exceeded those of H_β and H_γ . Results are discussed. H. C. G.

Structure and stationary states of the hydrogen and helium atoms. J. STARK (*Physikal. Z.*, 1937, **38**, 349—357).—The view that the atom and at. ion as well as the electron have an axial structure is developed. These considerations are applied to the study of at. spectra and the polarisation of the light emitted by positive rays. A. J. M.

Effect of number of electrons on the polarisation of the light emitted by positive rays. J. STARK and H. VERLEGER (*Physikal. Z.*, 1937, **38**, 357—358).—The polarisation of the light emitted by positive rays, with and without the application of an electric field, was investigated for H and He rays. The polarisation is greater without the field than with it, owing to the attraction of electrons by the field. The polarisation of the moving H and He lines is increased by increase in the no. of electron encounters, in agreement with the views of Stark on the axial structure of the electron and at. ion (preceding abstract). A. J. M.

Intensity ratio of moving and stationary series lines of hydrogen and helium. J. STARK and H. VERLEGER (*Physikal. Z.*, 1937, **38**, 359—360).—In the diffuse ortho-subsidary series of He, the ortho-principal series of He, and the Balmer series of H_2 the intensity decreases along the series more rapidly for the moving than for the stationary emission. A. J. M.

Series law of polarisation of light emission of positive rays. J. STARK and H. VERLEGER (*Physikal. Z.*, 1937, **38**, 360—362).—The connexion between polarisation of the light of positive rays and the inclination between the axes of electrons and at. ions indicated by the theory of Stark (cf. preceding abstract) requires a definite relationship between the polarisation of a line and the "inclination nos." in the two states giving rise to the line. For the diffuse ortho-subsidary series of He and the Balmer

series of H_2 it is shown that along these series the polarisation of the light emitted by positive rays decreases with increasing term no. The polarisation of a series line is the smaller the greater is the inclination no. of the stationary states ascribed to it. A. J. M.

Stark effect of ionised helium. Y. ISHIDA, S. HIYAMA, and H. KUBOTA (*Sci. Papers Inst. Phys. Chem. Res. Tokyo*, 1937, **31**, 265—280).—The data for the Stark effect at 4685, 3203, and 2733 Å. ($n = 4, 5$, and 6) agree, within experimental error, with the displacements and intensities calc. either on the basis of the old quantum mechanics or on the basis of Schrodinger's wave-mechanical theory. C. R. H.

Isotope shifts in Li I. D. D'EUSTACHIO (*Physical Rev.* 1937, [ii], **51**, 780).—The isotope shift of the Li I emission line $2P\text{--}2S$ (6708 Å.) is $0.330 \pm <0.010$ cm.⁻¹, in agreement with Hughes (cf. A., 1931, 1207). Since the calc. val. is 0.272 ± 0.007 it is inferred that an effect other than the simple mass effect is contributing to the displacement. N. M. B.

Level scheme and band spectra of N_2 and N_2^+ . A. VAN DER ZIEL (*Physica*, 1937, **4**, 373—378).—Savard's derivation of the dissociation energy of N_2 and N_2^+ (cf. A., 1936, 399) is criticised, and the position of the $^2\Pi_u$ level is considered to be still uncertain. The predissociation of the $^3\Delta$ level of the first positive group of N_2 is discussed. R. S. B.

Spectra of phosphorus. II. Spectra of P III, P IV, and P v. Additions and corrections to P II. H. A. ROBINSON (*Physical Rev.*, 1937, [ii], **51**, 726—735; cf. A., 1936, 397).—From spectrogram data using a vac. spark containing red P a complete revision and extension to include a large no. of new terms and intercombinations are tabulated. Ionisation potentials are P III 30.012 ± 0.003 , P IV 51.106 ± 0.013 , and P v 64.698 ± 0.003 volts. N. M. B.

Far ultra-violet spectra of sulphur and tellurium. L. BLOCH and E. BLOCH (*J. Phys. Radium*, 1935, [vii], **6**, 441—450; cf. Goudet, this vol., 336).—Using the electrodeless oscillating discharge, the spectrum of S has been extended to 328 and of Te to 157 Å., accurate to about 0.01 Å. Complete data and classifications are tabulated. N. M. B.

Enrichment of the argon isotope ^{36}A and the isotope shift effect. H. KOPFERMANN and H. KRUGER (*Z. Physik*, 1937, **105**, 389—394).—Using the Hertz apparatus the ^{36}A content of A was enriched to 50%. At this concn. the isotope shift effect could be readily observed and measurements were made with a 40-mm. etalon. Term shifts agreed with vals.

calc. from the Bohr formula with the exception of the $1s$, terms, which showed an exceptionally large shift.

H. C. G.

Spectrum of selenium in the far ultra-violet. G. GOUDET (J. Phys. Radium, 1935, [vii], 6, 433—438).—The spectrum excited by a high-frequency discharge in Se vapour has been measured between 1294 and 332 Å. A no. of new lines have been found. $\lambda\lambda$ are tabulated.

O. D. S.

Absorption bands in the neighbourhood of the lines of the principal series of rubidium and caesium. N. T. ŽÉ and C. S. PLAW (J. Phys. Radium, 1935, [vii], 6, 203—208).—Absorption bands have been found in the immediate vicinity of the first members of the principal series of Rb and Cs. These are probably due to Rb₂ and Cs₂.

A. J. M.

New fluctuation bands of cadmium vapour. A. KOTECKI (Bull. Acad. Polonaise, 1936, A, 560—568).—The fluorescence spectrum of Cd vapour shows 7 bands 2812—2970 Å. and 17 small "fluctuation" bands 2800—2640 Å. with average wave-no. difference 122 cm.⁻¹ Their position is independent of temp. 550—900° (intensity max. 650°) and pressure 20—2200 mm. Hg. They correspond with absorption bands, and are due to the electron transition 2^1P_1 to the ground state 2^1S_0 .

F. J. L.

Absorption and fluorescence spectra of indium vapour. R. WAJNKRANC (Z. Physik, 1937, 105, 516).—A correction of earlier work (this vol., 54).

L. G. G.

Induced predissociation of the tellurium molecule submitted to intense magnetic fields. E. OLSSON (Compt. rend., 1937, 204, 1182—1184).—Modifications produced in the absorption spectrum of Te vapour by a magnetic field of 45,000 gauss are discussed in relation to the induced predissociation.

A. J. E. W.

Production of white light by the electrical luminescence of xenon. M. LAPORTE (Compt. rend., 1937, 204, 1240—1242).—The luminescence produced by a condenser discharge in Xe at 2—6 mm. gives a continuous spectrum from the visible to 2200 Å., with only very feeble lines, and the distribution of energy is almost the same as that of the C arc.

R. S. B.

Arc spectra of the platinum group in concentrations of 5×10^{-4} , 5×10^{-5} , 5×10^{-6} , 5×10^{-7} , and 5×10^{-8} gram. J. G. AGUADO and S. PINA DE RUBÍES (Anal. Fis. Quím., 1936, 34, 875—900).—The method previously described (A., 1934, 48) is extended to Pt, Ir, Pd, Rh, Ru, Au, and Os. Intensities are recorded for the lines observed.

F. R. G.

Action of iron oxide on the emission spectrum of nitrogen-mercury systems excited by α -rays. A. LUYCKX (Nature, 1937, 139, 672—673).—When Fe₃O₄ in N₂ + 3H₂ is bombarded by α -rays for several hr. the gas emits a relatively intense green glow. Once activated, the Fe₃O₄ remains active even after contact with air. The H₂ appears to have only a diluting effect. The intensity of the Hg line 2536.7 is markedly increased in the presence of Fe₃O₄ bombarded by α -rays.

L. S. T.

Absorption spectrum of monatomic lead vapour in the region λ 2200—1600 Å. S. FRISCH and V. TSCHERNIAEV (Physikal. Z. Sovietunion, 1937, 11, 344—350).—The λ of lines in the absorption spectrum of monat. Pb $\lambda\lambda$ 1670—2000 Å. is measured. Terms are identified; the ionisation potential of the Pb atom is 6.379 volts.

F. J. L.

Optical spectrum of actinium. (Mlle.) W. A. LUB (Compt. rend., 1937, 204, 1417—1418).—The optical spectrum of Ac in presence of La has been determined, and the lines 4812.25, 4413.17, 4386.37, 4359.09, 4179.93, 4168.40, and 4088.37 Å. are assigned to Ac.

R. S. B.

Hydrogen emission in the chromosphere. D. H. MENZEL and G. G. CILLIE (Astrophys. J., 1937, 85, 88—106).—Intensities of the Balmer series are given up to H₃₁. A temp. of approx. 10,000° is deduced for the free electrons in the chromosphere. The chromospheric H spectrum probably arises from line excitation as well as from electron capture.

L. S. T.

New identifications of solar lines. C. E. MOORE (Astrophys. J., 1937, 85, 79—87).—In the solar spectrum 61 elements are present, 19 absent, 3 are doubtful (Sn, Tb, and Ta), and 2 have insufficient solar data (Ne and Cs). Laboratory data are needed for Sn, Tb, Th, U, Ho, Ma, and H. Os and Ir can now be regarded as definitely present. Tm has been detected for the first time: it occurs only in the ionised state. The strongest accessible line of Ne is suspected to be present in the chromosphere.

L. S. T.

Molecules in interstellar space? M. N. SAHA (Nature, 1937, 139, 840).—The interstellar lines 5780 and 6284 Å. may be due to the mols. NaK and Na₂, respectively.

L. S. T.

Standard arc lines. H. P. FINK (Naturwiss., 1937, 25, 284).—The least potential required for maintaining an arc is approx. the ionisation potential of the material of the electrodes. Ferromagnetic electrodes give lines which are strongly affected by magnetic fields.

A. J. M.

Sources of inaccuracies in spectrographic research. E. J. B. WILLEY (Nature, 1937, 139, 758).—Inaccuracies due to the effect of foreign materials in intensifying the spectrum of a given element are discussed. When the spectra are due to direct collision the ratio of intensities may indicate relative concns., but when the radiating particle receives energy from another body, i.e., a collision of the second kind, this relation does not hold, as is exemplified by the Hg-sensitised fluorescence of Na. Metrical interpretation of the results of spectrographic analysis must be regarded with reserve.

L. S. T.

Radiation from non-luminous flames. H. C. HOTTEL and V. C. SMITH (Trans. Amer. Soc. Mech. Eng., 1935, 57, 463—470).—A method for determining the total radiation from flames, due to CO₂, H₂O, and their mixtures, is described. Data are recorded.

CH. ABS. (e)

Theory of widening of spectral lines of a series by a foreign gas. C. REINSBERG (Z. Physik, 1937, 105, 460—467; cf. this vol., 208).—The theory

is developed to give a qual. explanation of the broadening of spectral lines in relation to their series no. Broadening in the neighbourhood of the series limit is calc. for a no. of examples and compared with experiment. It is shown that broadening varies with temp.

H. C. G.

Correction of continuous spectra for the finite resolution of the spectrometer. C. ECKART (Physical Rev., 1937, [ii], 51, 735—738).—Mathematical. The relation between the theoretical intensity function of a continuous spectrum and the intensity measured with an ionisation chamber or counter and a spectrometer is discussed, and an approx. solution of the correction problem is derived. A method involving the scansion of a template of the measured intensity λ curve by a photo-electric cell connected to a recording galvanometer is given.

N. M. B.

Characteristics of the Townsend current and influence of illumination on the starting voltage of a glow discharge. R. SCHADE (Z. Physik, 1937, 105, 595—619).—A theoretical and practical examination of the space charge in low-c.d. discharges between plane parallel electrodes. The lowering of starting voltage consequent on illumination of the cathode, and the c.d. of the resultant discharge, $\propto \sqrt{i}$ (i = photocurrent due to irradiation). The view of Rogovski, that these phenomena are due to the relation between field strength and γ (= no. of electrons arising from impact of one positive ion on the cathode), is confirmed.

L. G. G.

Production of X-rays by high-speed argon ions. M. TANAKA and I. NONAKA (Physical Rev., 1937, [ii], 51, 781—782).—A ions of energies >450 ke.v. obtained by the Sloan-Lawrence multiple linear accelerator method bombarded Li, Be, C, Mg, Al, Si, Ni, Cu, Zn, Mo, Pd, Ag, Cd, Sn, Pt, Au, and Pb, and the X-rays produced were investigated by Geiger counter. The characteristic series, determined by absorption measurements, were: K series, Mg, Al, Si; L series, Mo, Pd, Ag, Cd, Sn; M series, Pt, Au, Pb. The relative no. of photons of these characteristic radiations when thick targets are bombarded is tabulated and plotted against λ . In all cases a faint radiation of about λ 5.2 Å., produced by ions and not by electrons, and due to Pb or S contamination, was detected. The intensity of each characteristic radiation increased rapidly with ion energy.

N. M. B.

Attempt at photometry in the region of soft X-rays and application to the study of free electrons in metals. J. FARINEAU (Compt. rend., 1937, 204, 1242—1244).—The K and L X-ray spectra of Al and Mg have been studied. The experimental curve for the intensity distribution for the $K\beta_x$ rays agrees with that calc. from the theory of free electrons with Mg but not with Al.

R. S. B.

Effect of the penetration of X-rays on the resolving power. V. DOLEJSEK and J. KLEIN (Nature, 1937, 139, 886—887).—By screening a calcite crystal to a definite depth with a blunt Seemann edge, the resolving power for the $K\alpha$ lines of Ag is increased approx. five times. As in the case of ruled gratings, the resolving power of the space

lattice of crystals is limited owing to the widening of the lines caused by the penetration of the X-rays into the crystal.

L. S. T.

Spectrographic study of the conductivity electrons of magnesium and silicon. J. FARINEAU (Compt. rend., 1937, 204, 1108—1110).—A study of the intensity distributions in the K and L X-ray spectra shows that the two exterior electrons in the atom of metallic Mg are almost free; the four in Si are much more firmly bound.

A. J. E. W.

Auger effect in germanium. M. FERENC, jun. (Physical Rev., 1937, [ii], 51, 720—725).—Auger electrons ejected from the L and M levels of Ge were investigated by means of a magnetic spectrograph containing a small Geiger-Müller electron counter in place of a photographic plate. The max. energy of the Auger electrons arising from the $K \rightarrow L^2$ transition is 8599 ± 15 volts. The calc. energies of ejected Auger electrons agree well with observation. The estimated relative probability of $K \rightarrow L^2$ and $K \rightarrow LM$ transitions is 100 : 31, compared with the calc. val. 100 : 58.

N. M. B.

Thermionic emission into dielectric liquids. K. H. REISS (Physical Rev., 1937, [ii], 51, 781).—A discussion of the results of Baker (cf. this vol., 208).

N. M. B.

Photo-electric properties of potassium films of atomic thickness on platinum. I. H. MAYER (Ann. Physik, 1937, [v], 29, 129—159; cf. A., 1936, 129).—The work function of electrons emitted from the surface has a min. val. when the no. of K atoms is 0.7 of the no. required for a unimol. film. When the film contains gas the min. occurs at higher K atom concn. No selective photo-electric effect is shown by films of < 2 to 3 at. layers. The λ of max. selective effect depends on the thickness of the film, the rapidity of its deposition, and the amount of gas included. The work function of thick films of gas-free K is 2.26 ± 0.02 volts and is reduced by included gas to 2.0 volts. The change of sensitivity due to wandering of K atoms was investigated. The velocity distribution of electrons emitted from films of various thicknesses was measured.

O. D. S.

Specific ionisation by high-speed particles. M. G. E. COSYNS (Nature, 1937, 139, 802—803).—Measurements of the variation of primary ionisation of H_2 by electrons of energy ranging from 0.6×10^6 e.v. up to that of cosmic rays show that, contrary to theory, primary ionisation decreases for high-energy particles.

L. S. T.

Surface ionisation. P. LUKERSKI (Bull. Acad. Sci. U.R.S.S., 1936, 792—804).—The ionisation of Na and K atoms on an incandescent filament of thoriated W has the same temp. coeff. as the ionisation on pure W. A theoretical discussion of the influence of an electric field on surface ionisation is given; the ionic work function arises from electrostatic attraction between the ion and metal surface.

F. J. L.

Secondary electron emission from oxidised silver and molybdenum surfaces. A. V. AFANASIEVA and P. W. TIMOFEEV (Physikal. Z. Sovietunion, 1936, 10, 831—839).—The secondary electron emission

from oxidised Ag and Mo surfaces is $<$ that from the pure metal surfaces for all velocities of primary electrons. For thin layers of oxide the decrease is due to increased emission work, and for thicker films, to the smaller emission of the oxides compared with that of the metals. The position and val. of the max. of the secondary emission depend on the quantity of gas adsorbed on the surface. A. J. M.

Electron image and figure transmission with insulating and semi-conducting films. M. KNOLL and F. SCHROTER (Physikal. Z., 1937, 38, 330—333). A. J. M.

Positrons from radio-scandium. J. C. JACOBSEN (Nature, 1937, 139, 879—880).—The energy distribution of positrons emitted by radio-Sc, produced by irradiating CaO with α -particles from Rn, has been determined. No emission of X-rays corresponding with the *K* radiation of Ca, as would be expected from Konopinski and Uhlenbeck's modification of Fermi's theory of β -decay, could be detected. L. S. T.

Electron excitation and ion reflexion on bombardment of metals with K^+ ions. W. VEITH (Ann. Physik, 1937, [v], 29, 189—208).—Measurements have been made of the velocity of electrons emitted normal to the surface and of ions reflected on bombardment of a thick Cu plate, Al foil, and a thin Pt film by K^+ ions of 70—1140 volts velocity. Two groups of electrons were observed, (i) with velocity between 1 and 3 volts for all velocities of the primary beam, and (ii) covering a narrow range of higher velocities 16 to 19 volts for Pt and primary beam 280 volts. The velocity of the second group increases with increasing primary velocity and is greater for Al than for Pt. O. D. S.

Drift of ions and electrons in a magnetic field. L. TONKS (Physical Rev., 1937, [ii], 51, 744—747).—Mathematical. Townsend's equations for the drift of ions under the combined action of magnetic field, concn. gradient, and electric field are inconsistent with the Boltzmann equation. Corr. equations are discussed. N. M. B.

Action of slow positive ions on metal surfaces. W. BRUMMACK (Z. Physik, 1937, 105, 468—469).—Polished surfaces of various metals in the form of thick plates, thin sheets, or sputtered films, when exposed to a beam of K ions having a density of 10^{-8} amp. per sq. cm. and energy of 200 volts, for 1—15 min., are rendered passive to the action of I, HCl, and Hg vapours. H. C. G.

Nature and origin of large ions in the atmosphere. G. NADJAKOFF (Compt. rend., 1937, 204, 1236—1238).—The pptn. of large carbonaceous ions of diameter approx. 0.2μ on conducting wires has been studied. The pptn. for d.c. is that for a.c. R. S. B.

Limiting density and mol. wt. of ammonia. At. wt. of nitrogen. E. MOLES and J. SANCHO (Anal. Fis. Quím., 1936, 34, 865—874).— NH_3 from $Ni(NH_3)_6Br_2$ has d $0.759877 \pm 0.000014 + 0.011534p$ for $p = 0.3333$ to 1.0000 atm. in an apparatus described earlier (A., 1936, 1171), and in agreement with the val. for synthetic NH_3 . The ratio of the

limiting d $NH_3 : O_2$ is 0.532273, whence the mol. wt. of NH_3 is 17.0327 and the at. wt. of N is 14.009 ± 0.001 ($H = 1.0078$) or 14.0082 ($H = 1.0082$ allowing for the normal proportion of D). An error in the work of Moles and Batuecas (A., 1933, 453) is discussed. F. R. G.

Ions and isotopes. J. KENDALL (Proc. Roy. Soc. Edinburgh, 1937, 57, 182—189).—A summary of work on the separation of isotopes by methods involving ionic mobility and ionic discharge potential (fractional electrolysis). A. J. M.

Enrichment of the light argon isotopes by diffusion. H. BARWICK and W. SCHÜTZE (Z. Physik, 1937, 105, 395—398; cf. A., 1936, 1474).—Hertz's apparatus for the separation of isotopes has been improved. With A, after 60 hr. separation, the lighter fraction contained 0.5% of ^{36}A and 8.6% of ^{38}A . H. C. G.

Nuclear isomerism of bromine. W. BOTHE and W. GENTNER (Naturwiss., 1937, 25, 284).—Prolonged irradiation of EtBr with γ -rays from Li gives a third radioactive isotope of Br. Redetermination of half-life periods gives 5 min., 16 min., and 4.5 hr. for the three isotopes. From experiments on the taking up of neutrons by Br it is concluded that the 16-min. and 4.5-hr. nuclei are both ^{80}Br , this being an example of nuclear isomerism. Ordinary Br consists of ^{79}Br and ^{81}Br . A. J. M.

Half-life period of radium-E. (MISS) A. POMPÉR (J. Phys. Radium, 1935, [vii], 6, 471—472).—The half-life period, measured by the Curie-Chamié compensation method, is 5.02 ± 0.01 days. N. M. B.

Tracks of H- and α -particles in light-sensitive emulsions. A. JANOFF (J. Phys. Radium, 1935, [vii], 6, 233—241).—The tracks of H- and α -particles have been studied in various AgBr emulsions and the influences of particle size and [AgBr] have been considered. Emulsions which register the tracks of both particles have been prepared. Recoil protons of the α -particles and neutrons have also been detected. W. R. A.

Radioactive α -disintegration. L. GOLDSTEIN (J. Phys. Radium, 1936, [vii], 7, 527—532).—Mathematical. Theory is extended by treating the α -particle as a rigid sphere of finite radius. N. M. B.

Shape of the β -ray distribution curve of radium-E at high energies. L. M. LANGER and M. D. WHITAKER (Physical Rev., 1937, [ii], 51, 713—717).—The β -ray spectrum of Ra-E was measured by means of a magnetic spectrometer and coincident counters with special reference to the shape of the curve near the end-point. The distribution ended, without a tail, at 1.17×10^6 e.v. The Fermi and Konopinski-Uhlenbeck plots of the results do not give straight lines as predicted by theory. N. M. B.

Theory of β -radioactivity. A. MERCIER (Compt. rend., 1937, 204, 1117—1119). A. J. E. W.

β - and γ -rays of trans-uranium. L. MEITNER (Ann. Physik, 1937, [v], 29, 246—250).— β - and γ -ray spectra of the products of neutron bombardment of

U have been investigated. The max. energies in the β -spectra of $_{83}\text{ekaRe}$ (half life 16 min.), $_{84}\text{ekaOs}$ (half life 59 min.), and $_{96}\text{ekaPt}$ (half life 2.5 hr.) are about 3200 kv., 600 kv., and 700 kv., respectively. The γ -radiation from ekaRe is that from ekaOs.

O. D. S.

Calorimetric study of the γ -radiation from radium-B + C. I. ZLOTOWSKI (J. Phys. Radium, 1935, [vii], 6, 242—252; A., 1934, 938).—Using an adiabatic method, the total heat effect of the radiation of Ra in equilibrium with its disintegration products as a function of the thickness of absorbing screens of Pb and the energy of the γ -radiation have been measured.

W. R. A.

Absorption of γ -radiation by heavy metals as a function of wave-length. W. GENTNER (J. Phys. Radium, 1935, [vii], 6, 274—280).—The absorption of γ -radiation by heavy metals appears to be due almost entirely to the three processes, Compton effect, photo-electric effect, and the materialisation of the photon effect; other possible phenomena are responsible for $>1\%$ of the total absorption. Experimental results are in good agreement with theoretical vals.

W. R. A.

Variation of the absorption of hard γ -rays as a function of the atomic number. W. GENTNER and J. STARKIEWICZ (J. Phys. Radium, 1935, [vii], 6, 340—346).—The absorption coeffs. for γ -rays of Th-C'' of Li, H₂O, Mg, Al, S, Cu, Zn, Ag, and Pb have been measured. Vals. agree with theory (cf. preceding abstract).

O. D. S.

Positron spectra initiated by γ -rays of radium-C. A. I. ALICHANOV and P. E. SPIVAK (Physikal. Z. Sovietunion, 1937, 11, 354—355).—The energy distribution of positrons formed in Pb, Sn, and Cu foil by irradiation with γ -rays is measured.

F. J. L.

Positron spectrum of radium-C. A. I. ALICHANOV and P. E. SPIVAK (Physikal. Z. Sovietunion, 1937, 11, 351—353).—Two new points of discontinuity are observed in the positron spectrum of Ra-C at 360 and 1450 e.kv., corresponding with lines in the γ -spectrum at 1389 and 2470 e.kv.

F. J. L.

Origin of the non-homogeneity of the γ -radiation of slow neutron capture. B. PONTECORVO (J. Phys. Radium, 1936, [vii], 7, 511—513).—The γ -radiation emitted by Au on the capture of slow neutrons was investigated by means of a Geiger-Muller counter. Absorption in Pb shows that the composition of the γ -radiation varies as the neutron beam spectral composition is varied by filtration with B. Results are interpreted, with the help of selection rules, in the light of Bohr's hypotheses on neutron capture.

N. M. B.

γ -Rays from light elements due to proton bombardment. R. G. HERB, D. W. KERST, and J. L. MCKIBBEN (Physical Rev., 1937, [ii], 51, 691—698).—Using a high-potential electrostatic generator, Li, Be, B, F, Na, and Al gave γ -rays of sufficient intensity to permit accurate measurement. The yield was studied as a function of proton energy or generator voltage. For low potentials there was evidence of resonance excitation, and at high potentials the

intensity increased nearly exponentially with voltage up to the max. obtainable (2 m.e.v.). γ -Radiation from C, O, Si, K, Ca, Ni, Cu, Zn, Mo, Pt, and Pb was weak and indeterminate.

N. M. B.

Angular distribution of photo-neutrons from beryllium. T. GOLOBORODKO and L. ROSENKEVITSCH (Physikal. Z. Sovietunion, 1937, 11, 78—82).—The distribution of neutrons ejected from Be by γ -rays does not vary with direction. The effective cross-section for the scattering of Be photoneutrons by Be is $2.9 \pm 0.5 \times 10^{-24}$ sq. cm.

O. D. S.

Scattering and absorption of photo-neutrons from beryllium. A. LEIPUNSKI, L. ROSENKEVITSCH, and D. TIMOSHUK (Physikal. Z. Sovietunion, 1936, 10, 751—772).—The ratio of the initial activities of the Ag isotopes of half-life 22 sec. and 140 sec., respectively, produced by irradiation of Ag by photo-neutrons from Be, is independent of the thickness of the Be. The absorption of photo-neutrons in Ag was investigated, and the upper limit for the effective cross-section for the absorption was found to be 4.0×10^{-25} sq. cm. The absorption and scattering of photo-neutrons in Al, S, Fe, Cu, Zn, Sn, and Pb were investigated. Effective cross-sections for scattering are comparatively large, and increase with increasing at. no. The possibility of retardation of photo-neutrons from Be on passing through Al, S, Fe, Cu, Zn, Sn, Pb, and Be was examined. No inelastic collisions of neutrons occur in these elements.

A. J. M.

Energies of selective absorption bands of neutrons in silver. N. P. BORISOV (Physikal. Z. Sovietunion, 1936, 10, 711—717).—The energies of the A, B, and C groups of neutrons in the Ag isotope of half-life 22 sec. have been obtained, the absorption in B, after passing through a combined Ag and Cd filter, being determined. The absorption curves are not exponential, probably because the neutrons in group B do not all possess the same velocity. Ascribing the energy $2kT$ to the thermal neutrons (group C), the energy of those of group A (selectively absorbed in Ag) is 2.4 e.v. The neutrons of group B can be divided into soft and hard components of energies 0.17 and 115 e.v., respectively.

A. J. M.

Collision of neutron and proton. II. P. M. MORSE, J. B. FISK, and L. I. SCHIFF (Physical Rev., 1937, [ii], 51, 706—710; cf. this vol., 6).—Using a potential form and data selected in the light of recent available results, the elastic and inelastic collision of the neutron and proton have been computed for 0—40 m.e.v. energy range of the incoming neutron. The angular distribution of elastic scattering of neutrons and the elastic cross-section and capture cross-section for fast neutrons are in satisfactory agreement with experiment. Curves for cross-section for deuteron disintegration by γ -rays are computed.

N. M. B.

Scattering of neutrons by ortho- and para-hydrogen. J. SCHWINGER and E. TELLER (Physical Rev., 1937, [ii], 51, 775).—A method of determining the sign of the singlet state energy and the range of neutron-proton interaction and of investigating the spin dependence of the interaction is discussed.

N. M. B.

Width of iodine resonance neutron band. S. RUBEN and W. F. LIBBY (Physical Rev., 1937, [ii], 51, 774; cf. Preiswerk, A., 1936, 1044).—Measurements of the B absorption coeffs. of neutrons filtered by different thicknesses of I indicate that the absorption probably first removes the lower-energy section of a wide band or group of narrow bands leaving residual neutrons of higher energy, in agreement with Bethe's theory (cf. this vol., 214). N. M. B.

Attempt to detect the disintegration of the neutron. C. W. GILBERT, C. L. SMITH, and J. H. FREMLIN (Nature, 1937, 139, 796).—Two different types of experiments failed to confirm the disintegration of the neutron into a proton and an electron by bombardment with deuterons (cf. this vol., 4). The cross-section for this disintegration, if it takes place, is $<3 \times 10^{-28}$ sq. cm. L. S. T.

Method of measuring the magnetic moment of free neutrons. O. R. FRISCH, H. VON HALBAN, jun., and J. KOCH (Nature, 1937, 139, 756—757). L. S. T.

Nuclear stability in the region of the natural radioactive elements. (MME.) I. CURIE (J. Phys. Radium, 1935, [viii], 6, 417—419).—The stability of artificial radioactive nuclei can be predicted from a comparative study of natural radioactive elements. It is indicated that U-Z, isotope of Pa, has at. wt. 232. O. D. S.

Chemical detection of helium formed in beryllium by γ -rays. F. A. PANETH and E. GLÜCKAUF (Nature, 1937, 139, 712—713).—In Be irradiated by γ -rays from Rn, He has been detected in quantities that indicate ^4He and not ^3He to be the main product. L. S. T.

Energies and products involved in nuclear disintegration and synthesis. M. L. POOL (Ohio J. Sci., 1935, 35, 343—361).—A review. CH. ABS. (e)

Relation between the kinetic energy and range of protons. Case of artificial transmutations. G. MANO (Compt. rend., 1937, 204, 1244—1246).—The energy and range of protons formed by artificial transmutations have been calc. and agree with the experimental vals. R. S. B.

Induced radioactivity with neutrons from slow deuterons. E. BERTL, R. FÜRTH, F. OBOŘIL, and K. SIRTÉ (Natura, 1937, 139, 716).—In an investigation of the lower limit of voltages with which artificial radioactivity can be produced, two active components with periods of 22 ± 3 sec. and 100 ± 15 sec. and approx. equal intensities have been obtained by irradiation of Ag with slow neutrons produced by the action of deuterons on mica coated with Be. L. S. T.

Radioactive neon. T. BJERGE (Nature, 1937, 139, 757).—The radioactive substance of 40 sec. half-period obtained by bombarding Na (as stearate or butyrate) by fast neutrons, and generally assumed to be ^{23}Ne , can be removed from the place of activation by a stream of air, showing it to be a gas. L. S. T.

Radioactivity induced by fast neutrons according to the $(n, 2n)$ reaction. F. A. HEYN (Nature, 1937, 139, 842).—When bombarded with neutrons

from Li + D, Mo, Ag, Br, Sb, and Te give radioactive substances with half-periods corresponding with those obtained when γ -rays are used (this vol., 162). This is additional evidence (cf. *ibid.*, 5) that a neutron entering the at. nucleus may expel two neutrons with the production of a radioactive body. Ta gives only a poor activity. Se is strongly activated with a period of 56 min., Cd gives periods of 200 min. and approx. 20 min., Hg 43 ± 1 min., and Tl 4.1 min. due to ^{204}Tl . L. S. T.

Proton-induced radioactivity in heavy nuclei. S. W. BARNES, L. A. DU BRIDGE, E. O. WING, J. H. BUCK, and C. V. STRAIN (Physical Rev., 1937, [ii], 51, 775).—Si, Ca, Cr, Mn, Co, Ni, Zn, As, Se, Mo, Cd, In, Sn, and Sb become radioactive under bombardment by protons of about 3.6 m.e.v. from a cyclotron, but Mg, Al, Cl, Fe, Cu, Ag, Pt, and Pb appear to be unaffected. The relative activities of the first group as measured by an ionisation chamber after 15 min. bombardment with a beam of 1 microamp. are 6, 21, 5, 27, 6, 21, 40, 13, 2000, 10, 20, 3, 2, 1, respectively. For Mn, Co, and As the mechanism is probably proton capture with either deuteron or neutron emission. For Mn, chemical separation indicates $^{55}\text{Mn} + ^1_1\text{H} \rightarrow ^{56}\text{Mn} + ^1_0\text{n}$. There is evidence of large cross-section for the proton reaction. N. M. B.

Artificial radioactivity. M. E. NAHMIA and R. J. WALEN (J. Phys. Radium, 1937, [vii], 8, 153—159; cf. A., 1936, 1045, 1173).—The following new artificial radioelements, due to neutron bombardment, and half-life periods are reported: Li \rightarrow ^8Li (0.7 sec.); B \rightarrow ^8Li (1 sec. approx.); Na \rightarrow ^{20}F (8 sec.); Sn \rightarrow ^{123}Sn (6 min. approx.). The following periods are confirmed: Be \rightarrow ^8He (0.8 ± 0.04 sec.); F \rightarrow ^{20}F (8.4 ± 0.1 sec.); F \rightarrow ^{19}O (31 ± 1 sec.); Na \rightarrow ^{23}Ne (33 ± 1 sec.); Mg \rightarrow ^{23}Ne (33 ± 1 sec.). Attempts to establish the existence of a negative proton were unsuccessful. The relation of electronic periods with frequencies is discussed. Two methods for the study of short periods are described. N. M. B.

Tracks of cosmic rays obtained with a Wilson-Blackett chamber under special conditions. P. AUGER and P. EHRENFEST, jun. (J. Phys. Radium, 1935, [vii], 6, 255—256).—The results of an investigation of cosmic radiation by means of a Wilson-Blackett chamber under widely differing conditions agree with the hypothesis that two kinds of corpuscular radiation exist having practically the same energy but different penetrating powers. W. R. A.

Analysis of corpuscular cosmic radiation under a thickness of 8 metres of soil. P. AUGER and F. BERTEIN (J. Phys. Radium, 1935, [vii], 6, 253—254).—The effect of a thick screen of soil on cosmic radiation has been investigated, using the coincidence apparatus. The relatively large no. of coincidences appears to be due to secondary radiation, arising from the primary corpuscular rays within the earth screen. W. R. A.

Origin of cosmic radiation. H. ALFVEN (Compt. rend., 1937, 204, 1180—1181).—The production of cosmic rays by double stars (cf. this vol., 6) is discussed. A. J. E. W.

Spatial distribution of cosmic ultra-radiation. H. GEIGER and O. ZEILLER (*Z. Physik*, 1937, **105**, 517—521).—Nine counters are symmetrically disposed opposite a curved Pb plate so that the counters and plate lie on the circumference of the same circle. From the response probabilities of the counters, the divergence of radiation is confined within a mean angle of 20° to the chief direction of the shower.

L. G. G.

Cosmic rays and the magnetic moment of the sun. M. S. VALLARTA (*Nature*, 1937, **139**, 839).

L. S. T.

Cosmic ray showers. Y. WATASE (*Nature*, 1937, **139**, 671—672).—Coincidence discharge curves obtained with groups of four or five counters are practically linear and show that some, at least, of the showers are produced by a single elementary process. With three counters the curve is quadratic in character, which may indicate the existence of soft radiations of tertiary origin.

L. S. T.

Vapour-filled Geiger-Müller counters. A. TROST (*Z. Physik*, 1937, **105**, 399—444).—An experimental study of the effect on the properties of counters when filled with org. vapours at various pressures.

L. G. G.

Self-excitation in Geiger-Müller counters. V. G. VECHSLER and A. V. BIBERHALL (*Physikal. Z. Sovietunion*, 1937, **11**, 326—343).—The corona characteristic shows positive hysteresis effect, which decreases at low pressures, attributed to the heating of the gas by the corona. Spontaneous discharge results (*a*) if the tension is increased, (*b*) if the corona characteristic is displaced by warming of the gas due to a decrease in the internal resistance. The effect of capacity and temp. on the no. of counts is investigated.

F. J. L.

Relaxation time of nuclear spin in a magnetic field. H. FRÖHLICH and W. HEITLER (*Physikal. Z. Sovietunion*, 1936, **10**, 847—848).—The relaxation time of nuclear spin in a magnetic field for a mol. lattice at low temp. is about 0.1 sec., in agreement with Lasarev *et al.* (this vol., 121).

A. J. M.

Mass defects of the lightest atomic nuclei. S. FLÜGGE (*Z. Physik*, 1937, **105**, 522—536).—Mass defects of nuclei of mass 2, 3, and 4 have been recalculated on the hypothesis of Cassen and Condon (this vol., 6). It is shown that $\frac{1}{2}\text{H}$ cannot exist.

L. G. G.

Interaction in heavy atomic nuclei. H. EULER (*Z. Physik*, 1937, **105**, 553—575; cf. this vol., 214).—Mathematical. The mean mass defect in heavy atomic nuclei is calculated by an approximation which represents an improvement on the Thomas-Fermi method. Results are regarded as supporting the new views on nuclear forces advanced by Breit, Condon, Present, Feenberg, and Volz.

H. C. G.

Interaction of nuclear particles. B. KAHN (*Physica*, 1937, **4**, 403—405).—It is inferred that in the application of Fermi's theory to the interaction of proton and neutron the higher approximations give divergent results.

R. S. B.

Variation in magnetic moment of atomic nuclei by formation of particle pairs. H. SCHÜLER and H. KORSCHING (*Z. Physik*, 1937, **105**,

495—500).—Theoretical. The ratios of the nuclear magnetic moments of various atoms fall into a few distinct groups numerically. This indicates the formation of particle pairs in atomic nuclei.

H. C. G.

Proton-neutron conversion under the influence of γ -rays. G. RUMER (*Physikal. Z. Sovietunion*, 1937, **11**, 48—54).—Mathematical. The probability of the conversion of a proton (or neutron) into a neutron (or proton) by the absorption of a light quantum with simultaneous emission of a positron (or electron) and a neutrino is below limits of observation.

O. D. S.

Reaction of deuterium on deuterium. M. H. JOHNSON, jun. (*Physical Rev.*, 1937, [ii], **51**, 779).—A theoretical study of a certain class of nuclear transmutations is examined with a view of testing the identity of the magnitude and spin dependence of the sp. nuclear forces between elementary nuclear constituents (cf. Breit, this vol., 5).

N. M. B.

Nuclear forces. P. JORDAN (*Naturwiss.*, 1937, **25**, 273—279).—A review.

A. J. M.

Magnitude of nuclear forces. H. VOLZ (*Z. Physik*, 1937, **105**, 537—552; cf. this vol., 214).—Theoretical.

H. C. G.

Saturation property of nuclear forces. E. FEENBERG (*Physical Rev.*, 1937, [ii], **51**, 777; cf. this vol., 6).—Mathematical. An alternative formulation of the theory is presented.

N. M. B.

Approximately relativistic equations for nuclear particles. G. BREIT (*Physical Rev.*, 1937, [ii], **51**, 778; cf. this vol., 214).—Mathematical addendum to the proof of approx. invariance.

N. M. B.

Fermi's theory of positron disintegration. C. MÖLLER (*Physikal. Z. Sovietunion*, 1937, **11**, 9—17).—Mathematical. The conversion of a proton into a neutron by absorption of a neutrino and an electron is investigated from the point of view of Fermi's theory. For heavy nuclei, the probability of the electron being absorbed from the *K* level is $>$ that of obtaining it by positron emission. The probability of the process taking place with emission of a light quantum is investigated.

O. D. S.

Dirac theory of the electron. I. M. MARKOV (*Physikal. Z. Sovietunion*, 1936, **10**, 773—808).

A. J. M.

Dirac theory of electrons. II. Dirac equations of second order. M. MARKOV (*Physikal. Z. Sovietunion*, 1937, **11**, 284—296).—Mathematical.

F. J. L.

Neutrino theory of light. V. FOCK (*Physikal. Z. Sovietunion*, 1937, **11**, 1—8; cf. this vol., 60).—An amplification of earlier criticisms.

O. D. S.

Wave function of the photon. J. J. PLACINTEANU (*Compt. rend.*, 1937, **204**, 1238—1240).—Theoretical. The production of photons by the fusion of electrons and positrons is considered wave-mechanically.

R. S. B.

Determination of absorption coefficients of the atmosphere. II. Results. J. DUCLAUX (*J. Phys. Radium*, 1935, [vii], **6**, 401—406; cf. this vol., 330).—The absorption of the atm. from 3700 to

6670 Å. is most simply interpreted on the assumption that theoretical vals. for the Rayleigh scattering are too high. A selective absorption in the blue is probably due to small quantities of NO_2 . O. D. S.

Theoretical determination of the effects of absolute magnitude of molecular bands in stellar spectra. M. NICOLET (Bull. Acad. roy. Belg., 1937, [v], 23, 287—294).—Theoretical vals. of the abs. magnitude agree well with observed vals. of abs. luminosity for a no. of diat. mols. W. R. A.

Induced predissociation in the visible spectrum of bromine. L. AVRAMENKO and V. KONDRATEEV (Physikal. Z. Sovietunion, 1936, 10, 741—750).—The predissociation shown in the visible absorption spectrum of Br, induced by collisions with foreign mols. (N_2 , CO, and air), has been investigated. The effect is the same for all three foreign gases, four max. being observed. The dependence of the variation of the absorption coeff. ($\Delta\chi$) on the pressure of foreign gas (p) is given by $\Delta\chi = kp$ ($p < 500$ mm.). The effective cross-section with respect to induced predissociation is about 60 times the gas-kinetic cross-section. Chemical forces play only a small part in the effect. A. J. M.

Relative measurement of the absorption coefficients of ozone in the region of Chappuis' bands. (MME.) A. TOURNAIRE-VASSY (Compt. rend., 1937, 204, 1413—1414).—Absorption of O_3 in the visible and in the ultra-violet has been compared, and coeffs. have been determined for λ 4600—6695 Å. R. S. B.

Absorption spectrum of liquid nitrous oxide. B. VODAR (Compt. rend., 1937, 204, 1324—1326).—Vals. for the extinction coeff. of liquid N_2O for $\lambda\lambda$ 2275, 2300, 2325, and 2350 Å. are recorded. The absorption varies with the temp. H. J. E.

Air afterglow and thermal radiation of nitrogen peroxide. V. KONDRATEEV (Physikal. Z. Sovietunion, 1937, 11, 320—325).—The spectrum of the air afterglow is identical with the thermal emission spectrum of NO_2 , $\lambda\lambda$ 4000—6400 Å., indicating that the carrier of the afterglow is the NO_2 mol. An attempt is made to systematise the thermal emission spectrum of NO_2 . F. J. L.

Absorption spectrum of terbium. W. PRANDTL (Z. anorg. Chem., 1937, 232, 267—270).—The lines at 5728 and 5225 Å., previously attributed to Tb, are due to traces of Nd (cf., A., 1934, 1286). F. J. G.

Intensity formulæ for triplet bands. A. BUDO (Z. Physik, 1937, 105, 579—587).—Expressions for the intensity distribution in branches of $^3\Sigma \leftrightarrow ^3\Pi$ and $^3\Pi \leftrightarrow ^3\Pi$ bands are given. These are valid for all vals. of the coupling const., Y , of the $^3\Pi$ terms. A formula may also be derived for $^3\Pi \rightarrow ^3\Pi$ bands. Calc. vals. agree well with measurements on the $\text{PH } ^3\Pi \rightarrow ^3\Sigma$ bands. H. C. G.

New ultra-violet $\rightarrow ^1\Sigma$ band system of gold deuteride, and a new analysis of gold hydride spectrum. S. IMANISHI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 247—264).—With the exception of the 1 1 transition which has zero intensity, all the bands corresponding with transitions

from $v' = 0, 1, 2$, to $v'' = 0, 1, 2, 3$ levels in the $\text{AuD } ^1\Sigma \rightarrow ^1\Sigma$ system have been analysed in the region 3370—4440 Å. The corresponding $\text{AuH } ^1\Sigma \rightarrow ^1\Sigma$ system has been re-examined and compared with the AuD system. An electronic displacement $\nu_e(\text{AuH}) - \nu_e(\text{AuD}) = +21.6 \text{ cm.}^{-1}$ has been observed. A vibrational-rotational isotope coeff. has been obtained which is only slightly $>$ that calc. from the simple isotope theory. C. R. H.

Band spectrum of germanium oxide. A. K. SEN GUPTA (Z. Physik, 1937, 105, 487—494).—The band spectrum of GeO in the C arc has been photographed between 2340 and 3300 Å. with a spectrograph of high resolving power. A no. of new bands has been measured, the band system has been extended to $v' = 10$ and $v'' = 9$, and isotope vibration lines confirmed. H. C. G.

Paramagnetism. IV. Ultra-violet absorption spectra of paramagnetic halides in solution and the nature of chemical linkage in them. S. DATTA and M. M. DEB (Phil. Mag., 1937, [vii], 23, 1005—1017; cf. A., 1936, 135).—The ultra-violet spectra due to halogen ions or atoms in CrCl_3 , CoCl_2 , and NiCl_2 in EtOH , H_2O and various concns. of HCl were investigated to test the different kinds of linkings between the paramagnetic and the halogen ions at different temp. and in different solvents. For aq. solutions the edge of continuous absorption is on the shorter side of 220 $\text{m}\mu$ and shifts slightly to longer λ with increasing concn.; it is inferred that there is strong dissociation and that the absorption is mainly due to Cl^- . For a given concn. in EtOH or aq. HCl the edge undergoes a very large shift to longer $\lambda\lambda$, and this is attributed to the formation of undissociated halide mols. For the same solutions at very low temp. the edge shifts back to a similarly large extent owing to dissociation. N. M. B.

Band spectrum of mercurous iodide. T. S. SUBBARAYA, B. N. RAO, and N. A. N. RAO (Proc. Indian Acad. Sci., 1937, 5, A, 365—371).—Data are recorded for $\lambda\lambda$ 4129—4488 Å. and are analysed. The results accord with those of Terenin (A., 1927, 1009), but not with those of Wieland (A., 1930, 652). J. W. S.

Band spectrum of cadmium iodide. T. S. SUBBARAYA, N. A. N. RAO, and B. N. RAO (Proc. Indian Acad. Sci., 1937, 5, A, 372—376).—Data are recorded for $\lambda\lambda$ 6005—6340 Å. and are analysed. J. W. S.

Absorption spectra, optical activity, and isotopic exchange. C. H. JOHNSON and N. H. POYNTON (Nature, 1937, 139, 842—843).—Changes in the absorption spectra of the cobaltammines produced by substitution of D for ^1H and the effect on the optical rotation of the H and D isomerides of Co triethylenediamine ion are described. L. S. T.

Continuous absorption spectrum of methyl iodide. D. PORRET and C. F. GOODEVE (Trans. Faraday Soc., 1937, 33, 690—693; cf. A., 1936, 775).—Extinction coeffs. have been determined over the range 50,000—27,000 cm.^{-1} . There is a max. at 38,800 and a min. at 47,400 cm.^{-1} . The results are discussed. F. L. U.

Ultra-violet absorption spectra of pyridine and pyridine derivatives. C. W. F. SPIERS and J. P. WIBAUT (Rec. trav. chim., 1937, 56, 573—593).—Data are recorded for C_5H_5N and 27 derivatives. The results are discussed. F. L. U.

Properties of the ultra-violet spectrum of salicylic acid as a function of the p_H . (MLLE.) H. SCHULER (Compt. rend., 1937, 204, 1422—1424).—The influence of the p_H on the band in the 300 m μ region has been determined. The absorption coeff. is const. at p_H 5—10. From inflexions on the p_H absorption curve the dissociation consts. have been calc.; p_K = 2.0, 3.7, 10.5, and 12.2. At p_H 10.5—12.2 the CO_2H and OH are dissociated, and some undissociated salt may be formed; at p_H 4.6—10 the CO_2H is dissociated, but the OH is not. It is inferred from the appearance of the two consts. = 2.0 and 3.7 instead of the electrochemical val. 2.9, that the dissociation of the OH is accompanied by quinonoid transformation. R. S. B.

Comparison of absorption and fluorescence spectra of anthracene in different states of aggregation. A. A. SCHISCHLOVSKI (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 29—33).—The absorption and fluorescence spectra of anthracene as vapour, in solution, and cryst. were compared. The absorption spectra are similar in form, but are displaced towards the red on passing from vapour or solution to the cryst. state, and there is also a difference in intensity. The fluorescence spectra are similar to each other, consisting of four main bands, but they are displaced towards the red on passing from vapour, through solution, to the cryst. state. The energy distribution is different in the fluorescence spectra in the different states. The effect of the λ of the exciting light on the fluorescence spectrum was examined. With short λ excitation the fluorescence spectrum of the vapour becomes blurred, but there is no effect on the spectrum of the EtOH solutions or the crystals. Luminescence has been excited in the vapours of fluorescein, rhodamine-B, and other dyes of this class. A. J. M.

Q Branch and analysis of the hydrogen sulphide band at 10,100 A. P. C. CROSS (J. Chem. Physics, 1937, 5, 370—371).—A reply to Carvin (this vol., 166). Photographs of plates are reproduced. The locations of observed lines are compared with the positions calc. for the transitions assigned to these lines on the basis of the centrifugal distortion theory; good agreement is obtained. W. R. A.

Valency angle in hydrogen sulphide. B. L. CRAWFORD, jun., and P. C. CROSS (J. Chem. Physics, 1937, 5, 371).—By applying intensity considerations to the Q branch of the band at 10,100 A. the valency angle is 92° and not 85° as suggested by Sprague and Nielsen (this vol., 166). The bands at 3.7 and 8.0 μ are discussed and the difficulties of arriving at a complete vibrational analysis are considered. W. R. A.

Infra-red absorption spectra of the deuterium sulphides. A. H. NIELSEN and H. H. NIELSEN (J. Chem. Physics, 1937, 5, 277—283).—The spectra of HDS and D_2S have been examined with a grating

spectrometer of high dispersion. HDS gives a well-resolved band at 9.0 μ with evenly spaced lines 6.85 cm.⁻¹ apart but showing no indication of a Q branch. No absorption attributable to HDS was found at 3.8 μ , contrary to the results of Bailey, Thompson, and Hale (this vol., 9). In D_2S bands have been found at 3.75, 5.0, and 10.7 μ with line spacings of 4.8, 5.0, and 5.0 cm.⁻¹, respectively. The origin of the bands and the structure of the mol. are discussed. Evidence in favour of a vertical angle of 85° is adduced, although the val. 92° cannot be excluded completely until more experimental data become available. W. R. A.

Absorption of ultra-violet light by organic substances. XLII. Datiscetin, morin, and quercetin. (Miss) R. GRINBAUM and L. MARCHLEWSKI (Bull. Acad. Polonaise, 1937, A, 60—71).—Two maxima are observed in the extinction curves of datiscetin λ 2640 and 3750 A., morin λ 2630 and 3715 A., and quercetin λ 2555 and 3755 A. The similarity is due to the common 2-phenyl- γ -pyrone nucleus, but the OH groups influence both λ and log ϵ of the max. F. J. L.

Pressure effect in bands of several dipole molecules. S. D. CORNELL (Physical Rev., 1937, [ii], 51, 739—744; cf. A., 1936, 1179).—In view of the divergence of available data, several photographic infra-red bands of H_2O , HCN, and NH_3 have been investigated for line broadening due to increased pressure of the vapours. Excess broadening per atm. is calc. from the half-widths at 1 atm., and comparison with simple dipole interaction theory is made. Effects of change in slit width on the observed line width and rate of broadening are discussed. N. M. B.

Infra-red absorption of various solutions of acetic acid. W. GORDY (J. Chem. Physics, 1937, 5, 284—287).—The C=O band at 5.75 μ has been investigated for solutions of various concn. of AcOH in C_6H_6 , in CCl_4 , and in Pr^{β}_2O . For both C_6H_6 and CCl_4 the band became sharper, its intensity increased, and its centre was shifted towards longer λ . Similar, although much less pronounced, effects were encountered in the Pr^{β}_2O solutions. These changes are due to variations in the polymerisation of the AcOH mols. at the different dilutions. No shifts were observed for solutions of EtOAc in C_6H_6 and in Pr^{β}_2O . W. R. A.

Infra-red absorption of mixtures of methyl alcohol with ethyl formate and with ethyl acetate. D. WILLIAMS and W. GORDY (J. Amer. Chem. Soc., 1937, 59, 817—820).— HCO_2Et and $EtOAc$ displace the OH band of $MeOH$ to the shorter $\lambda\lambda$ and increase its intensity. $MeOH$ displaces the CO band of HCO_2Et and $EtOAc$ to the longer $\lambda\lambda$ and increases its intensity. The esters probably tend to decrease the polymerisation of $MeOH$ and to become associated with it through weak H linkings. E. S. H.

Infra-red absorption spectra and modes of vibration of some C_1 and C_2 halogen derivatives. G. EMSCHWILLER and J. LECOMTE (J. Phys. Radium, 1937, [vii], 8, 130—144).—Measurements are reported for frequencies 1450—525 cm.⁻¹ of the infra-red absorption spectra of halogen derivatives of CH_4 ,

C_2H_6 , C_2H_4 , and C_2H_2 and most of the absorption max. are identified, with the help of other available and Raman data, with definite modes of mol. vibration. Certain frequencies are related to C-halogen linkings, or to C-H-halogen interactions, and the extent to which these frequencies are influenced by the nature of the mols. is examined. The *cis*- and *trans*-isomerides of dichloro- and di-iodo-ethylene have been identified unambiguously. N. M. B.

Infra-red absorption spectra of mono- and di-substituted derivatives of benzene. Symmetry of benzene. J. LECOMTE (Compt. rend., 1937, 204, 1186—1189).—General observations on the infra-red absorption and Raman spectra, between 500 and 1350 cm^{-1} , of about 20 mono- and 100 di-substituted C_6H_6 derivatives are recorded, and the positions of the principal bands given. The symmetry of these derivatives is probably D_{2h} . A. J. E. W.

s-Trideuterobenzene and the structure of benzene. C. R. BAILEY, A. P. BEST, R. R. GORDON, J. B. HALE, C. K. INGOLD, A. H. LECKIE, L. H. P. WELDON, and C. L. WILSON (Nature, 1937, 139, 880).—The more prominent frequencies in the Raman spectrum and infra-red absorption max. of $s-C_6H_3D_3$ are tabulated. L. S. T.

Technique for examining infra-red absorption of organic substances. I. II. Infra-red absorption spectrum of pure and dissolved benzene. M. AUMÉRAS and (Mlle.) A. M. VERGNOUX (Bull. Soc. chim., 1937, [v], 4, 825—838, 839—846).—I. A spectrometer and radiomicrometer of the Rubens type, and the method of operation, are described.

II. Absorption curves obtained with rock-salt and quartz prisms are given for C_6H_6 alone and dissolved in CCl_4 , in the range λ 0.8—4 μ . The positions of the bands agree with those found by previous workers. The band at 2.45 μ is not displaced, and its width is scarcely affected, by dilution with CCl_4 . F. L. U.

OH and CH bands of phenol and its derivatives between 6000 Å. and 9500 Å. P. BARCHIEWITZ (Compt. rend., 1937, 204, 1184—1186; cf. this vol., 282).— $\lambda\lambda$ of two bands in the neighbourhood of 0.75 μ , attributed to OH, are given for PhOH, *o*- and *p*- $C_6H_4Cl\cdot OH$, and *m*-4-, *m*-5-, and *m*-2-xenol. The occurrence of two bands with PhOH is probably due to the action of neighbouring mols. on the OH group; the band of higher λ disappears on raising the temp. The effect of temp. and dilution on the $\lambda\lambda$ of the OH and CH bands in PhOH is described. A. J. E. W.

Spectrum characteristics of hydrogen bonds. R. M. BADGER and S. H. BAUER (J. Chem. Physics, 1937, 5, 369—370).—Substances containing H or OH bonds have been examined in the photographic infra-red. The vapour of AcOH gave a narrow intense OH band at 9750 Å., but as the association increased the band became weaker and the association equilibrium measured photometrically gave results in good agreement with the v.d. data. Dil. solutions of MeOH in CCl_4 and of EtOH in CS_2 give a sharp OH band which diminishes in intensity as the concn. is increased. Similar features have been observed in the spectra of liquid $CH_3Ac\cdot CO_2Et$, MeOH, EtOH,

H_2SO_4 , HCO_2H , and AcOH, and in CCl_4 solutions of HCO_2H , AcOH, and $CCl_3\cdot CO_2H$, all showing a broad absorption region with two components for the acids and four or five for the alcohols. The results show that there is a definite spectrum characteristic of the OH group if the H is engaged in a H bond. Since the characteristics of the different compounds are similar there appears to be no distinction between H and OH bonds. W. R. A.

Near infra-red absorption spectra and Raman spectra of nitrogen derivatives. III. Chelation and dissimulation of tetra-co-ordinated nitrogen. (MME.) M. FREYMAN and R. FREYMAN (J. Phys. Radium, 1936, [vii], 7, 506—510; cf. this vol., 282).—In contrast to the case of amines and non-substituted amides, mono-substituted amides $R\cdot CO\cdot NH\cdot R$ exhibit only very weak bands. This is discussed in relation to chelation. Sidgwick's explanation is compared with one based on the presence of single electronic linkings, which, though less general, seems to accord better with observed data. The phenomenon of dissimulation (cf. A., 1935, 563) is discussed. N. M. B.

Interpretation of chemical properties on the hypothesis of the hydrogen linkage. Infra-red absorption spectra. (MME.) M. FREYMAN and R. FREYMAN (Bull. Soc. chim., 1937, [v], 4, 944—950; cf. this vol., 131, 167).—The authors' work on infra-red absorption is summarised. Keto-enol isomerism, chelation in $o\text{-}OH\cdot C_6H_4\cdot CHO$, tautomerism of acid amides, formation of oxonium and NR_4 compounds, and certain cases of mol. association are interpreted on the hypothesis of a H linkage. F. L. U.

Vibration spectra and molecular structure. II. Force constants of the C-C and C-O bonds in organic molecules. L. G. BONNER (J. Chem. Physics, 1937, 5, 293—297; cf. this vol., 62).—An approximation method which neglects the interactions between motions of H atoms and other atoms is used to calculate the force consts. from known vibration data. The C-C and C-O force consts. of C_2H_6 , C_3H_8 , cyclopropane, $(CH_2)_2O$, EtOH, *iso*- C_4H_{10} , Me_2O , and MeOH are approx. 3.8 and 4.5×10^5 dynes per cm., respectively. W. R. A.

Calculation of the vibration frequencies of the N_2O_4 molecule. J. DUCHESNE (Compt. rend., 1937, 204, 1112—1114; cf. A., 1933, 1102).—The frequencies are calc. by analogy with C_2H_4 . A. J. E. W.

Borates and oxides in the far infra-red. M. PARODI (Compt. rend., 1937, 204, 1111—1112; cf. A., 1928, 565; 1935, 1189).—Data for transmission and reflexion, in the λ range 20—63 μ , by Ca, K, Mn, Cu, and Pb borates, and Ca, Pb, Cu, and Zn oxides, are given. A. J. E. W.

New source of long-wave infra-red rays. M. LEVITSKAJA (Physikal. Z. Sovietunion, 1936, 10, 697—702).—An afterglow from a MgO anti-cathode was found to consist of long- λ infra-red having no action on a photographic plate. The transparency of various substances towards the radiation resembles that towards the longest known infra-red rays. The

radiation is scattered to a considerable extent at surfaces, especially metallic surfaces. A. J. M.

Raman effect and dipole moment in relation to free rotation. VI. K. KOZIMA and S. MIZUSHIMA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 296—310).—Data are recorded for the Raman spectra of solid $(\text{CCl}_2\text{Br})_2$ (I) and for the dipole moments of (I), C_2Cl_6 , $(\text{CHBr}_2)_2$, $o\text{-C}_6\text{H}_4\text{Cl}\cdot\text{OH}$, and $o\text{-C}_6\text{H}_4(\text{CH}_2\text{Br})_2$ using C_6H_{14} , C_7H_{16} , CCl_4 , C_6H_6 , and Et_2O as solvents. The moments for (I) and C_2Cl_6 are zero and the Raman spectrum of (I) bears out the conclusion that the *trans* is the only stable form. The structures of the other compounds are discussed. C. R. H.

Deuterium compounds. III. Raman spectra of deuterium compounds of the type $\text{CD}_3\cdot\text{CO}\cdot\text{X}$. W. ENGLER (Z. physikal. Chem., 1937, B, 35, 433—441; cf. A., 1936, 777).—By the action of PCl_3 on $\text{CD}_3\cdot\text{CO}_2\text{D}$ $\text{CD}_3\cdot\text{COCl}$ has been obtained, and from it, by action of H_2O , $\text{CD}_3\cdot\text{CO}_2\text{H}$. The Raman spectra of these compounds and $\text{CH}_3\cdot\text{CO}_2\text{D}$, $\text{CD}_3\cdot\text{CO}_2\text{D}$, and $\text{CO}(\text{CD}_3)_2$ have been determined and interpreted. R. C.

Raman spectra of deuteroparaldehyde and paraldehyde. R. W. WOOD (J. Chem. Physics, 1937, 5, 287—289).—A modified technique is described. Deuteroparaldehyde gives 19 and paraldehyde 23 Raman lines excited by 4358 Å. Hg line. Comparison with previous data reveals some recorded lines as spurious. W. R. A.

Raman spectra. II. Monomethoxy-derivatives of ethyl benzoate. D. D. THOMPSON (J. Amer. Chem. Soc., 1937, 59, 816—817; cf. A., 1936, 1445).—The Raman spectra, b.p., *d*, *n*, and mol. refraction of the *o*-, *m*-, and *p*-derivatives are recorded. E. S. H.

Raman effect. LXV. Various organic substances. K. W. F. KOHLRAUSCH, A. PONGRATZ, and R. SEKA. **LXVI. Nitrogen compounds. III.** K. W. F. KOHLRAUSCH and A. PONGRATZ (Monatsh., 1937, 70, 213—225, 226—235; cf. this vol., 220).—**LXV.** Raman frequencies are recorded for HgEt_2 , HgPh_2 , Et_2 *d*-tartrate, succinyl chloride, α - and β -picoline, pentamethylenetetrazole, $\text{CH}_2\text{Ac}\cdot\text{OAc}$, $\text{OH}\cdot\text{CHMe}\cdot\text{CH}_2\text{Ac}$, $\text{CMe}\cdot\text{CMe}$, benzoquinone, $\text{CHMe}\cdot\text{CHEt}$, isoamyl crotonate, $\text{CH}_2\cdot\text{CH}\cdot[\text{CH}_2]_8\cdot\text{CO}_2\text{Me}$, *Et* oleate, α -terpineol, 2-ethoxy- Δ^1 -cyclohexene, and 1:2-dibromocyclohexane. J. W. S.

LXVI. Data are recorded for $\text{NHMe}\cdot\text{CO}\cdot\text{NH}_2$, $\text{CO}(\text{NMe}_2)_2$, NHMeAc , NMe_2Ac , $\text{NHMe}\cdot\text{CO}\cdot\text{Et}$, $\text{NMe}_2\cdot\text{CO}_2\text{Et}$, $\text{CH}_2\cdot\text{CMe}\cdot\text{CHAc}$, $\text{NHMe}\cdot\text{CMe}\cdot\text{CHAc}$, and $\text{NMe}_2\cdot\text{CMe}\cdot\text{CHAc}$. J. W. S.

Raman effect. LXVII. Ring strain. II. K. W. F. KOHLRAUSCH and R. SKRABAL. **LXVIII. III.** L. KAHOVEC and K. W. F. KOHLRAUSCH. **LXIX. IV.** L. KAHOVEC and S. MARDASCHEW. **V. Ultra-violet absorption of esocyclic ketones.** G. FORSTER, R. SKRABAL, and J. WAGNER. **LXX. Crystal powder method.** H. CONRAD-BILLROTH, K. W. F. KOHLRAUSCH, and A. W. REITZ (Z. Elektrochem., 1937, 43, 282—285, 285—288, 288—289, 290—292, 292—293; cf. A., 1936, 777).—**LXVII. II.** The C-C pulsation frequencies in *cyclo*-pentane,

-butane, and -propane derivatives increase, in this order, more slowly than would be expected for unstrained ring systems. The observed increase in the CH valency frequencies with decreasing ring size is attributable chiefly to strengthening of the C-C linking. With compounds of the type $\text{R}\cdot\text{CO}\cdot\text{Y}$ ($\text{Y} = \text{Cl}$ or alkyloxy) there is a gradual decrease in the $\cdot\text{CO}$ frequencies in passing from $\text{R} = \text{Pr}^s$, through 5-, 4-, and 3-membered rings, to C_2H_4 derivatives. Further evidence of constitutive influences on $\cdot\text{CO}$ frequency is afforded by comparison of a no. of esocyclic ketones of 6- and 5-membered rings. Raman spectra of *cyclo*-pentanone and -butanone are given.

LXVIII. III. $\cdot\text{CO}$ frequencies of acid anhydrides and esters are compared. Raman spectra are given for maleic, citraconic, dimethylmaleic, acrylic, and crotonic anhydrides, Me_2 citraconate, and Et_2 dimethylmaleate.

LXIX. IV. Raman spectra of the anhydrides and Et_2 esters of *cis*- and *trans*-hexahydrophthalic acid are given. In accordance with expectation the more highly strained *trans*-forms have the higher $\cdot\text{CO}$ frequencies.

V. Ultra-violet absorption spectra of keten, *cyclo*-butanone, -pentanone, and -hexanone have been measured. The band structure is displaced towards longer λ with increasing strain.

LXX. A new method is described, whereby the Raman spectrum of a solid in the form of cryst. powder can be obtained, using about 1 c.c. of powder and an exposure of 2—10 hr. The method is as yet imperfectly developed. F. L. Ü.

Effect of temperature on the wing accompanying Rayleigh scattering in liquids. K. BAPAYYA (Current Sci., 1937, 5, 532—533).—In order to investigate the weakening in the abs. intensity of the Rayleigh scattering in C_6H_6 in passing from vapour to liquid (cf. Bhagavantam, this vol., 168) the λ 4358 Rayleigh line was microphotometered with C_6H_6 at 210° under 18 atm. and at room temp. Results indicate that at higher temp. the extent of the wing does not alter, there is no increase in intensity in the external portions, but the wing within 20—50 λ from the centre shows a marked increase in intensity. The results of other investigators are examined. N. M. B.

Influence of temperature on the continuous spectrum in the neighbourhood of the Rayleigh line. E. GROSS and M. VUKS (J. Phys. Radium, 1935, [vii], 6, 457—461).—Investigations made for xylene, Ph_2O , and COPh_2 show that rise of temp. increases the intensity of the central part but does not affect the outer part of the spectrum. The spectral range is unchanged. The outer part is treated as a vibrational Raman effect, and an interpretation of results is discussed. Microphotometric curves for Ph_2O at 18° and 250° are given. N. M. B.

Fluorescence of gadolinium salts and their solutions. R. TOMASCHEK and E. MEHNERT (Ann. Physik, 1937, [v], 29, 306—310).— $\text{Gd}_2(\text{SO}_4)_3\cdot 8\text{H}_2\text{O}$ in the solid state and in aq. solution when excited by $\lambda\lambda < 2880$ Å. shows a strong line fluorescence partly

coinciding with the absorption at 3100 Å. but extending to longer λ . O. D. S.

Fluorescence of rare earths in solution. I. O. DEUTSCHBEIN and R. TOMASCHEK (Ann. Physik, 1937, [v], 29, 311—323).—The fluorescence of solutions of $\text{Eu}(\text{NO}_3)_3$, $\text{Sm}(\text{NO}_3)_3$, $\text{Tb}(\text{NO}_3)_3$, and $\text{Dy}(\text{NO}_3)_3$ in H_2O , of the CH_3Ac derivative of Sm in EtOH , and of $\text{CH}_3\text{Ac}\cdot\text{CO}_2\text{Et}$ derivatives of Eu and Tb in C_6H_6 and EtOH has been measured. O. D. S.

Influence of concentration on the distribution of intensity in the photoluminescence spectrum of glycerol solutions of tryptaflavine. (Miss) A. WRZESINSKA (Bull. Acad. Polonaise, 1936, A, 568—574).—The spectrum of glycerol solutions of tryptaflavine (>10 g. per c.c.) shows at -180° three bands (two fluorescent and one phosphorescent), and at 20° two bands (fluorescent); intensity and λ vary with concn. There are two kinds of mol. present arising from polymerisation or excited states due to the influence of the solvent. F. J. L.

Chemi-luminescence of 3-aminophthalhydrazide under the action of molecular oxygen and hæmin as catalyst. B. TAMAMUSHI (Naturwiss., 1937, 25, 318).—An alkaline solution of 3-aminophthalhydrazide containing a small amount of cryst. hæmin becomes luminescent when O_2 is passed through the solution at room temp. The effect is obtained in dil. solution (0.01%) and is not inhibited by HCN. P. W. C.

Quenching of fluorescence of solids by adsorbed gases. V. GATSOHKOVSKI and A. TEREININ (Bull. Acad. Sci. U.R.S.S., 1936, 805—832).—The fluorescence spectrum of Al_2O_3 exhibits strong quenching in the blue end when adsorption of vapour takes place (Cl_2 and I strongest, MeI, O_2 , H_2O vapour, weaker). MeOH, MeCN, and NH_3 produce initial increase in intensity due to removal of traces of O_2 . The effect is due to capture of the photoelectron ejected primarily from the fluorescing centre. F. J. L.

Influence of viscosity and solvent on the degree of polarisation of fluorescence. P. PRINGSHEIM and H. VOGELS (J. Phys. Radium, 1937, [vii], 8, 121—124; cf. A., 1936, 778, 792).—Measurements of polarisation of fluorescence of dyes in viscous media give data on the mobility of mols. surrounded by a solvent layer. Determinations of polarisation as a function of η have been made for various dyes in binary liquid mixtures; the vals. found differ widely with the solvent and indicate that a val. for η different from that obtained by macroscopic measurements must be introduced in Perrin's formula. N. M. B.

Rate of charge of a droplet in an ionic field. N. FUCHS, I. PETRIANOV, and H. ROTZEIG (Bull. Acad. Sci. U.R.S.S. 1936, 833—841).—The law governing the rate of charge of droplets of radius $0.5\ \mu$ is the same as that for particles of radius $3\text{--}4\ \text{mm}$. F. J. L.

Double ionisation of atoms. F. K. RICHMYER (Rev. Sci. Instr., 1937, [ii], 8, 139—140).—A lecture. N. M. B.

Origin of static electricity on the surface of solid dielectrics. J. STRACHAN (Nature, 1937, 139, 803).—When similar surfaces of the same

dielectric, e.g., ebonite, dry cellulose, dry gelatin, or white mica, are pressed together under a pressure of $100\text{--}120$ lb. per sq. in. and separated, the contact surfaces are charged, one positively and one negatively. This can be explained by Freundlich's theory of the production of charges by the rupture of surface adsorption layers. L. S. T.

Ionisation of air by electrified dielectrics. F. PERRIER (Compt. rend., 1937, 204, 1174—1175).—Current inversions observed on discharging an electrified dielectric in an ionisation chamber are due to ionisation of air in the chamber, and not to a polarised condition of the dielectric. A. J. E. W.

Thermionic emission of salts diffusing through copper. J. CICHOCKI (J. Phys. Radium, 1935, [vii], 6, 397—400; cf. A., 1934, 125, 1053).—The energy loss of the Na^+ ion emitted at 1000° from NaCl enclosed in Cu is 5.9 ± 0.3 volts and is independent of temp. and of the accelerating potential. No halogen ions were detected in the negative emission from CaF_2 , KCl, KBr, and KI enclosed in Cu. The work function of electrons emitted is 1.4 volts for CaF_2 , from 1000° to 1290° . The work function of electrons from SrO in Cu increases from 2.1 volts at 1100° to 5.0 volts at 1400° . It is supposed that emission takes place from a surface film composed of Cu, diffused metal atoms, and oxides of the two metals. No emission of positive ions was observed during the reduction of NaCl by a mixture of Cu and Ca at 800° . O. D. S.

Secondary emission and fatigue of photo-sensitive oxygen-cæsium electrodes. I. F. KVARZCHAVA (Physikal. Z. Sovietunion, 1936, 10, 809—819).—The fatigue of a Cs- O_2 photo-sensitive electrode results in a decrease of the secondary emission. The mechanism of the action of such electrodes was investigated. The strong secondary emission is due to the ionisation by primary and secondary electrons of Cs atoms adsorbed in the Cs_2O layer. A. J. M.

Relationship between secondary electron emission and photosensitivity. A. DOBROJUBSKI (Physikal. Z. Sovietunion, 1937, 11, 118—121; cf. A., 1936, 1321).—Cs-Cs₂O-Ag, Cs-Cs₂O-Cu, and Cs-Cs₂O-Ni films differ in photosensitivity in the visible and infra-red, but have equal vals. of ultra-violet sensitivity and of secondary emission. Fatigue of a Cs-Cs₂O-Ag film occurs chiefly in the visible and infra-red, only small, parallel, decreases in the ultra-violet sensitivity and secondary emission being observed. O. D. S.

Barrier layers and the Becquerel effect. J. ROULLEAU (J. Chim. phys., 1937, 34, 227—235).—The electrochemical and photo-electric effects at a barrier layer are distinct, but may coexist at certain electrodes, e.g., Cu_2O on Cu, if a barrier layer is formed at the surface of the film. J. W. S.

Properties of the barrier layer in valve photo-cells. V. P. JOUSE (Physikal. Z. Sovietunion, 1937, 11, 122—127).—No photosensitivity was observed in valve photo-cells with barrier layers composed of materials showing no inner photo-effect (e.g., SiO_2 , BaO_2) deposited on a semi-conducting

layer of Cu_2O , when precautions are taken to prevent sensitising of the semi-conductor during deposition. The valve photo-effect is observed with a layer of Ti_2S , showing inner photo-effect, on Cu_2O . O. D. S.

Influence of temperature on the photo-electric primary current in crystals. R. W. POHL (Ann. Physik, 1937, [v], 29, 239—245).—The temp. coeff. of the photo-electric primary current in a KCl crystal containing colour centres is over a certain range of temp. (-130° to -70° approx.) of the same sign and magnitude as the temp. coeff. of the electrical conductivity of metals. O. D. S.

Spectral distribution of the inner photo-effect in cuprous oxide. A. V. JOFFE and A. T. JOFFE (Physikal. Z. Sovietunion, 1937, 11, 241—262).—The photoconductivity curve of Cu_2O shows max. at λ 800, 630 (displaced towards shorter λ with decreasing thickness of specimen), and 280 $\text{m}\mu$. The photoconductivity per unit of absorbed energy or no. of absorbed photons is const. between λ 500 and 620 $\text{m}\mu$. λ max. in the inner photo-effect correspond with those in the absorption band, for thin specimens. F. J. L.

Influence of carbon tetrachloride vapour on puncture voltages of air. G. M. KOVALENKO (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 545—548).—Addition of CCl_4 vapour to air raises the breakdown voltage; in mixtures, the val. of this voltage is the sum of the breakdown voltages of CCl_4 vapour and air at pressures corresponding with the partial pressures of the components in the mixture. E. S. H.

Positive electrical saturation. A. PIEKARA (Compt. rend., 1937, 204, 1106—1108).—A theoretical discussion of change in ϵ . A. J. E. W.

Dielectric constant of ionised gases. A. IMAM and S. R. KHAISTGIR (Phil. Mag., 1937, [vii], 23, 858—865).—Measurements were made of the dielectric consts. of the ionised gases Cl, Br, I, and Tl vapour, for different ionic concns. and for the λ range 3.98—5.4 m., avoiding the formation of ionic sheaths. In all cases the val. obtained was <1 . For Cl and Tl the val. decreased as the discharge current increased, supporting the Eccles-Larmor theory, but for I the change of dielectric const. was almost independent of current. The dielectric const. decreased approx. $\propto \lambda^2$ up to a certain λ , supporting the Eccles-Larmor formula, but beyond that λ it increased, a result attributed to a resonance effect. N. M. B.

Interpretation of the association of water on the basis of dielectric polarisation measurements. O. FRUHWIRTH (Monatsh., 1937, 70, 157—167).—From measurements of the dielectric consts. and d^{20} of mixtures of $(\text{CH}_2)_6\text{N}_4$ with CCl_4 and with H_2O it is concluded that $(\text{CH}_2)_6\text{N}_4$ has almost zero electric moment. In accord with van Laar's calculations (A., 1900, ii, 189), it is concluded that double quadrupole mols. are formed in H_2O . J. W. S.

Precision method for the determination of the molecular polarisation of non-dissociating liquids. F. H. MÜLLER (Z. Physik, 1937, 105, 513—515).—A criticism of work already noted (this vol., 12). L. G. G.

Dipole moment and solvent. II. Electric moment of some amines. III. Electric moment of diisopropyl ketone. K. HIGASI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 311—316, 317—320).—II. The moments of NH_2Et_2 and NEt_3 show a positive solvent effect when dissolved in C_6H_6 and C_6H_{14} , the moment increasing with increasing dielectric const. (ϵ) of the solvent.

III. The moment of COPr^t_2 , which has a negative Kerr const. (K), shows a negative solvent effect when dissolved in C_6H_6 , C_6H_{14} , and CS_2 , the moment decreasing with increasing ϵ of the solvent. The behaviour is similar to that of COMe_2 , which has a positive K . C. R. H.

Dielectric constants of cyclohexane and benzene. (MLLE.) J. HADAMARD (Compt. rend., 1937, 204, 1234—1235).—For C_6H_6 at $9.2-40.3^\circ$ ϵ is 2.306—2.247, and for C_6H_{12} at $6.2-38.15^\circ$ is 2.044—1.9945. R. S. B.

Dielectric properties of acetylenic compounds. VII. Alkyl- and aryl-propiolonitriles. Resonance in the acetylene triple linking. B. C. CURRAN and H. H. WENZKE (J. Amer. Chem. Soc., 1937, 59, 943—944; cf. A., 1935, 1056).—Electric moments for butyl-, amyl-, phenyl-, and *p*-tolyl-propiolonitriles have been determined; the vals. prove the existence of resonance in these mols. The electro-meric polarisability of the C_2H_2 triple linking is $>$ that of Ph. E. S. H.

Dipole moment of 2:4-dichlorophenol. C. E. SUN and C. LIU (J. Chinese Chem. Soc., 1937, 5, 39—40).—Data for $\text{C}_6\text{H}_3\text{Cl}_2$ solutions of 2:4- $\text{C}_6\text{H}_3\text{Cl}_2\cdot\text{OH}$ lead to the dipole moment 1.59 D. J. G. A. G.

Dependence on field strength of the dielectric constant, and the Kerr effect. C. J. BOUWKAMP and B. R. A. NIJBOER (Physica, 1937, 4, 379—388).—The influence of optical anisotropy on the variation of dielectric const. with field strength is calc. for liquids with permanent dipoles, and it is shown that only an upper val. of the dipole moment may be calc. from the experimental data; vals. are given for Et_2O , CHCl_3 , and PhCl . Errors in published formulæ for the Kerr effect are discussed. R. S. B.

Relationship between the refraction and the b.p. of halogenated derivatives of methane and silicon hydride. J. M. STEVELS (Chem. Weekblad 1937, 34, 334—340).—A review including some brief references to the author's work on this subject, to be published in more detail later. S. C.

Is the birefringence of liquid crystals independent of the effect of the surroundings or the action of the magnetic field? P. CHATELAIN (Compt. rend., 1937, 204, 1352—1353).—The magnetic birefringence of films of liquid crystals of *p*-azoxyphenetole and *p*-azoxyanisole between glass plates is unchanged by a magnetic field up to 20,000 gauss. The effect \propto the film thickness up to a thickness of 0.7 mm. H. J. E.

Photo-electric investigation of the Allison magneto-optic effect. G. C. COMSTOCK (Physical Rev., 1937, [ii], 51, 776—777).—An extended precision investigation, the solutions tested being CS_2 ,

dil. HCl, and a mixture of CoCl_2 , NiCl_2 , and CuCl_2 , gave no indication of min. of the type reported by Allison, and tend to disprove the existence of the effect. N. M. B.

Optical rotatory dispersion in the carbohydrate group. VIII. Tetramethyl- δ -gluconolactone and tetramethyl- δ -galactonolactone. T. L. HARRIS, E. L. HIRST, and C. E. WOOD (J.C.S., 1937, 848—852; cf. A., 1936, 1363).—The rotatory dispersion of the above compounds and tetramethyl- γ -gluconolactone in four solvents can be represented by single-term equations of the Drude-Natanson type, corresponding with an active absorption band near 2000 Å. It is inferred that the band controlling the rotation of the lactones is to be ascribed to the lactonic CO group and that the whole of the observed rotation is due to induced dissymmetry. R. C.

Comparison between the laws for the thermal variation of magnetic rotatory power for manganese and gadolinium nitrates and for cerium, neodymium, and praseodymium nitrates. H. OLLIVIER (Compt. rend., 1937, 204, 1326—1328).—In the first group of nitrates the sp. magnetic rotatory power (G) increases gradually with rising temp. In the second group $1/G \propto$ the temp. H. J. E.

Kerr effect of nitrobenzene in benzene. H. FRIEDRICH (Physikal. Z., 1937, 38, 318—329).—The Kerr effect of carefully purified PhNO_2 in C_6H_6 has been investigated over the entire concn. range. The results are discussed on the basis of the Debye theory of hindered rotation of mols. in liquids. The hindrance to rotation increases with concn., the relative increase being greater for the more dil. solutions. This explains the considerable decrease of the mol. Kerr const. of PhNO_2 in dil. C_6H_6 solution, and the smaller decrease in the more conc. solutions. A. J. M.

Structure of organic compounds. K. K. DUBROVAI (Sotzial. Rekonst. Nauk., 1935, No. 4, 17—32, No. 5, 44—67, No. 6, 26—48).—A theory of structure based on attractive and repulsive forces between atoms is developed. The following bond lengths (Å.) are deduced: C—C, 1.54; C—C, 1.45; C—C, 1.03; C—H, 1.54. The planar Kekulé structure for C_6H_6 is rejected and an alternative proposed. CH. ABS. (r)

Aromatic and unsaturated compounds. Theoretical investigations of their constitution and properties. E. HÜCKEL (J. Phys. Radium, 1935, [vii], 6, 347—358).—A lecture. The application of the method of Hund and Mulliken to the theory of the structure of aromatic and unsaturated compounds is discussed. O. D. S.

Relation between chromophore and valency theories. M. PESTEMER (Angew. Chem., 1937, 50, 343—348; cf. A., 1935, 1051).—Older theories are reviewed and conceptions based on modern valency theory are discussed. F. L. U.

Interchange equilibrium of deuterium; partition between water and hydroxyl group; number of interchangeable hydrogen atoms in complex salts. G. OKAMOTO (J. Fac. Sci. Hokkaido Imp. Univ., 1937, III, 2, 81—94).—The partition

of D_2 between MeOH and H_2O was calc. from its partition coeffs. between H_2 gas and MeOH and H_2O separately. Only the OH group in MeOH takes part in the exchange. By dissolving in, and separating from, excess of 100% D_2O , and washing out the D_2 with "light" water, it was found that all the H atoms in $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3 \cdot 5\text{H}_2\text{O}$, $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$, $[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}]\text{Cl}_3$, and $[\text{Co}(\text{NH}_3)_4\text{CO}_3]\text{Cl}$ were interchangeable. R. C. M.

Empirical formula for the spectroscopic determination of internuclear distances in diatomic molecules. D. CRESPIN and M. DESIRANT (Bull. Acad. roy. Belg., 1937, [v], 23, 308—316).—A new empirical formula is derived and used to calculate the internuclear distance of approx. 50 diat. mols.; the results are compared with the vals. obtained by Morse's formula. W. R. A.

Dependence of predissociation limit on rotational energy. M. ELIASHEVITSCH and B. STEPANOV (Physikal. Z. Sovietunion, 1936, 10, 703—710).—Theoretical. The dependence of the predissociation limit on the rotational quantum no. J for different types of predissociation is considered. The conditions under which predissociation limits may be found in successive vibrational levels are discussed. The special case where only the low vibrational levels are predissociated can occur, but is rare. A. J. M.

Electronic energy bands in metallic calcium. M. F. MANNING and H. M. KRUTTER (Physical Rev., 1937, [ii], 51, 761—764).—Using the Wigner-Seitz-Slater cellular method (cf. A., 1934, 828), energies are calc. and plotted. The conductivity is due to an overlap between the lowest s band and the d band. Binding energy, pressure coeff. of resistance, and paramagnetic susceptibility are interpreted in terms of calc. results. N. M. B.

Molecular resonance systems. I, II.—See A., II, 241.

Infra-red spectrum and ground vibration bands of diacetylene, butadiene, and vinylacetylene. E. BARTHOLOMÉ and J. KARWEIL (Z. physikal. Chem., 1937, B, 35, 442—454).—The spectra of the gaseous compounds between 3 and 23 μ have been examined. The ground bands of C_4H_2 have been revised; the transverse vibrations of the C_4 chain all lie above 500 cm^{-1} . Resolution of the parallel C—C band at 2020 cm^{-1} indicates that the mol. is approx. linear. The ground vibration frequencies of C_4H_6 and C_4H_4 have been identified. In most C_4H_6 mols. at room temp. the two halves rotate freely about the C—C axis. R. C.

Double minimum problem applied to the ammonia molecules. F. T. WALL and G. GLOCKLER (J. Chem. Physics, 1937, 5, 314—315).—Mathematical. A simplified approx. treatment of the symmetrical double min. problem is given and applied to calculate the doublet separations for NH_2D , NHD_2 , and ND_3 , the particular mode of vibration considered being that in which the N atom of the mol. oscillates through the plane of the H atoms. Calc. and observed vals. are in good agreement. W. R. A.

Large molecules in science and life. H. S. TAYLOR (Science, 1937, 85, 299—301).—An address. L. S. T.

Molecular shape and cohesion. I. Intramolecular compensation of cohesional forces in thread-shaped molecules. G. BERGER (Rec. trav. chim., 1937, 56, 589—604).—The discrepancy between the b.p. of the normal paraffins and those to be expected on London's theory (this vol., 116) is explained by assuming a partial internal compensation of the cohesional forces, caused by irregular crumpling of the mols. in the liquid state. This conception is shown to lead to Sugden's b.-p. formula (A., 1913, ii, 382). F. L. U.

Long-range interactions between dipole molecules. H. MARGENAU and D. T. WARREN (Physical Rev., 1937, [ii], 51, 748—753).—Mathematical. The first-order van der Waals forces between symmetrical top mols. which carry a dipole along their figure axis are calc., and their strength is compared with that of other interactions. A simple preliminary theory of the effect of these forces on the width of spectral lines in bands of polyat. mols. is given. N. M. B.

Structure and kinetics of dense liquids. E. FAHRE (Rev. Fac. Sci. Istanbul, 1937, 2, 119—125).—Mathematical. Expressions determining the intermol. field in a non-ideal liquid, and equations of motion for an ellipsoidal mol. in this field, are derived. C. R. H.

Formula for the calculation of nuclear distances and energies of separation. E. L. LEDERER (Österr. Chem.-Ztg., 1937, 40, 208—210).—Theoretical. The calc. distances and energies are in good accord with experimental data. J. W. S.

Free energy of diatomic carbon vapour. A. R. GORDON (J. Chem. Physics, 1937, 5, 350—352).—An equation for the rotational state sum for a $^{12}\text{C}_2$ mol. with intermediate coupling is derived from Budo's expression for rotational energy and is used to calculate the free energy of C_2 vapour. A revised equation for the equilibrium const. between C_2 and C in the vapour is given. W. R. A.

Nature of the crystalline fields present in $\text{Er}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$. F. H. SPEDDING (J. Chem. Physics, 1937, 5, 316—320).—The splitting of the basic state of $\text{Er}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ due to lattice forces has been calc. by the methods of Penney and Schlapp and of Van Vleck. On the assumption of a cubic field the vals. obtained agree well with the spectroscopic data of Meehan and Nutting. Similar calculations have been made for $\text{Dy}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$, but here there is only a rough qual. agreement with experiment; reasons are advanced for this. Magnetic susceptibility expressions are given for both salts and vals. for the Er salt agree with experimental data. W. R. A.

Lattice theory of alkaline-earth carbonates. B. Y. OKE (Proc. Indian Acad. Sci., 1937, 5, A, 326—328; cf. A., 1936, 1185; this vol., 67, 228).—Previously recorded results are revised and compared. J. W. S.

Thomson-Gibbs equation for crystals. I. N. STRANSKI and R. KAISCHEV (Z. physikal. Chem., BB (A., I.)

1937, B, 35, 427—432).—A form of the above equation is given for the equilibrium of crystals in which the sp. surface, edge, and corner energies vary with the size of the crystal. Examples of the application are discussed. R. C.

Surface tension and vapour tension of dipolar liquids. J. J. BIKERMAN (J. Phys. Radium, 1935, [iii], 6, 469—470).—The theory is proposed that in associated liquids dipolar mols. orient themselves spontaneously at the liquid-vapour interface. An explanation of the main anomalies of such liquids on this basis is given. N. M. B.

Atomic parachors and chemical analogies. Consequences. R. LAUTHÉ (Bull. Soc. chim., 1937, [v], 4, 863—869; cf. this vol., 67, 116).—If the at. parachors of the elements are plotted against those of the inactive gases which occur in the same series, elements belonging to the same family are situated on straight lines which are nearly parallel. A similar arrangement occurs when for the parachor is substituted mol. vol., mol. refraction, latent heat of fusion or vaporisation, or at. entropy. F. L. U.

Parachor of boron trifluoride and boron trifluoride-ethers. E. WIBERG and W. MATHING (Ber., 1937, 70, [B], 690—697).—The experimentally determined parachor, 294.6, of $\text{BF}_3 \cdot \text{Et}_2\text{O}$ agrees almost exactly with that deduced from measurements with BF_3 and Et_2O ($87.3 + 209.7 - 1.6 = 295.4$). The increase in the no. of outer electrons of B from 6 in BF_3 to 8 in $\text{BF}_3 \cdot \text{Et}_2\text{O}$ does not cause appreciable change in the at. parachor. H. W.

Theory of fine structure in the X-ray absorption spectra of molecular gases. B. V. BOGDANOVITSCH (Physikal. Z. Sovietunion, 1937, 11, 83—94; cf. Petersen, A., 1933, 332).—Mathematical. A formula is developed for the fine structure of X-ray absorption spectra of triat. mols. O. D. S.

Fine structure of the Laue X-ray pattern obtained by the method of convergent X-rays. T. FUJIWARA (J. Sci. Hiroshima Univ., 1937, 7, 179—182).—The patterns obtained with fine circular single-crystal wires of W and Al are illustrated and discussed. J. W. S.

Striations of Laue interference spots. L. CHROBAK and J. CHOJNACKI (Bull. Acad. Polonaise, 1937, A, 86—92).—When λ max. — λ min. for a Laue interference spot includes strong lines in the spectrum of the target, the spot shows rectilinear striations. F. J. L.

Distribution of angular values in crystals. I. I. SCHAFRANOVSKI (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 377—380).—Mathematical. J. W. S.

Recent crystallography. (Sir) W. BRAGG (Nature, 1937, 139, 865—866, 911—913).—A lecture. L. S. T.

Nucleus formation in recrystallisation. IV. Orientation of nuclei in recrystallisation. M. KORNFIELD. V. Recovery and the rate of nucleus formation. M. KORNFIELD and A. SCHAMARIN (Physikal. Z. Sovietunion, 1937, 11, 297—301, 302—306).—IV. The crystal grains in hard-drawn Al wire are oriented with [111] parallel to the wire axis.

Heating decreases the degree of orientation but stretching produces no effect.

V. Single Al crystals have been examined, with 11–15% deformation, and recovery temp. 200–350°. Recovery increases the no. of new grains.

F. J. L.

Lattice dimensions of electroplated and normal chromium. W. A. WOOD (Phil. Mag., 1937, [vii], 23, 984–991).—A comparison of the lattice spacings of pure, electro-deposited, and annealed Cr, through a study of the diffuse type of spectral line characteristic of Cr plate, shows that the unit cube of the electro-deposit is $>$ that of pure Cr, and that expansion persists after annealing. The fractional increase of lattice spacing of annealed Cr was 0.00093, of bright plated over pure Cr 0.00205, and of dull-matt plated 0.0015. Results indicate that most of the gases co-deposited in Cr plating and responsible for its particular properties are adsorbed on the constituent crystallites.

N. M. B.

Crystal structure of selenium dioxide. J. D. McCULLOUGH (J. Amer. Chem. Soc., 1937, 59, 789–794).—X-Ray investigation shows that sublimed SeO_2 is tetragonal with a_0 8.353 ± 0.005 Å. and c_0 5.051 ± 0.010 Å. The structure consists of chains of alternating Se and O atoms along the c axis, with O of a second kind linked to each Se. The observed interat. distances are recorded.

E. S. H.

Bent surfaces of rock-salt. D. B. GOGOBERIDSE (Physikal. Z. Sovietunion, 1936, 10, 826–830).—The bent surfaces of rock-salt crystals obtained by plastic deformation under H_2O , which focus X-rays (Komar, A., 1936, 522, 1449), are shown to consist of a no. of rectilinear blocks of side 0.01–0.1 mm.

A. J. M.

Crystal structure of Ni_3Sn . P. RAHLFS (Metallwirts., 1937, 16, 343–345).— Ni_3Sn has a hexagonal dense-packed lattice, a 2.6375, c 4.234 Å., and a superstructure for which $a' = 2a$ and $c' = c$. The Hume-Rothery rule is obeyed if Ni is considered to be univalent.

C. E. H.

Mixed hexachloroaurates. A. FERRARI (Gazzetta, 1937, 67, 94–98).—The structures $\text{Cs}_2\text{Au}[\text{AuCl}_6]$ and $\text{Cs}_2\text{Ag}[\text{AuCl}_6]$ are derived from X-ray measurements, and compared with that of $\text{Cs}_2\text{Cd}[\text{CdCl}_6]$.

O. J. W.

Structure of cupriferoxyanides. I. Copper ferrocyanide and ferrocyanides of copper and potassium. II. Ferrocyanides of copper and univalent cations. R. RIGAMONTI (Gazzetta, 1937, 67, 137–146, 146–158).—I. X-Ray measurements show that the structure of $\text{Cu}_2\text{Fe}(\text{CN})_6$, of $\text{CuK}_2\text{Fe}(\text{CN})_6$, and of $\text{Cu}_3\text{K}_2\text{Fe}_2(\text{CN})_{12}$ is face-centred cubic, with a 9.97–9.99 Å., and with 4, 4, and 2 mols. per unit cell, respectively. The unit cell has a characteristic interstitial structure, which accounts for the formation of mixed crystals of the type $[\text{Cu}_2\text{Fe}(\text{CN})_6]_n[\text{CuK}_2\text{Fe}(\text{CN})_6]_m$ during the pptn. of the ferrocyanides and confirms the existence of the complex ion $\text{CuFe}(\text{CN})_6^{4-}$ in the above compounds. The same structure can be extended to compounds of the type $\text{R}^{\text{II}}\text{M}^{\text{I}}_2\text{Fe}(\text{CN})_6$ and $\text{R}^{\text{II}}\text{M}^{\text{I}}\text{Fe}(\text{CN})_6$, in which the ionic diameter of R^{II} is about 1.60 Å. and of M^{I} or $\text{M}^{\text{II}} < 3.2$ Å.

II. The structures of the following compounds have been determined by means of electron diffraction measurements (also by means of X-rays in the case of the first four): $\text{CuLi}_2\text{Fe}(\text{CN})_6$; $\text{CuNa}_2\text{Fe}(\text{CN})_6$; $\text{Cu}(\text{NH}_4)_2\text{Fe}(\text{CN})_6$; $\text{CuRb}_2\text{Fe}(\text{CN})_6$; $\text{Cu}_2\text{Fe}(\text{CN})_6$; $\text{CuK}_2\text{Fe}(\text{CN})_6$; $\text{CuH}_2\text{Fe}(\text{CN})_6$; $\text{CuTi}_2\text{Fe}(\text{CN})_6$. They all have the structure given above, and can be considered as salts of the acid $\text{H}_2\text{CuFe}(\text{CN})_6$. The structure of thin ferrocyanide films is discussed in relation to their osmotic resistance.

O. J. W.

Mechanical twinning structure in calcspar.

II. Secondary cleavage in the twinning-plane. D. B. GOGOBERIDSE and L. R. NAKASCHIDSE (Physikal. Z. Sovietunion, 1936, 10, 820–825; cf. A., 1935, 1311).—Twinned crystals of calcspar show a secondary cleavage in the twinning plane as well as the normal cleavage. This is due to an excess of free energy in the twinning plane produced by forces between the normal and the twinned crystal. Normal crystals showed no trace of cleavage in the (110) plane.

A. J. M.

Fluorophors of the layered-lattice type and their properties. A. KUTZELNIGG (Angew. Chem., 1937, 50, 366–367; cf. A., 1936, 664).—A lecture.

F. L. U.

Crystallographic study of fatty acid molecules.

F. D. LA TOUR (J. Phys. Radium, 1937, [vii], 8, 125–129).—Investigations on the shape, distribution, and equilibrium in the crystal lattice of mols. of palmitic, stearic, glutaric, and pimelic acids show that the shape is almost invariable, but the distribution and equilibrium are modified with variations of temp. and physical conditions, and depend on the action between C chains and between terminal groups; the latter control mainly modifications of the lattice relative to angle of the mol. with the lattice base plane, and the former control the distribution of the mols. in a plane normal to their axis.

N. M. B.

X-Ray study of the orientation of fatty acids on graphited surfaces. Applications to lubrication. J. J. TROLLAT and R. FRITZ (J. Chim. phys., 1937, 34, 136–139).—Particles of graphite deposited on glass from colloidal solution are oriented with the planes of the hexagons parallel to the glass. Stearic acid (I) shows regular orientation on glass, on graphite-covered glass or quartz, but not on quartz itself. Fused (I) does not wet polished Fe, and thin layers show little sign of orientation; on unpolished Fe, or on Fe covered with graphite, oxide, or sulphide layers, wetting takes place and orientation is good.

F. A. A.

Interferometric determinations with halogen-substituted paraffins. H. BERGER (Physikal. Z., 1937, 38, 370–379).—The scattering curve of X-rays in $\alpha\beta$ - and $\alpha\gamma$ -dichloropropane, $\text{CH}_2(\text{CH}_2\cdot\text{CH}_2\text{Cl})_2$, and $(\text{CH}_2\text{Br})_2$ has been investigated. The hindrance to free rotation in Cl_2 -substituted paraffins decreases with increasing length of chain, so that for derivatives of C_5H_{12} the rotation is almost free. Dipole moment determinations indicate that the hindrance to free rotation increases when Cl is replaced by Br.

A. J. M.

X-Ray study of the structure of elastoidin fibres. G. CHAMPETIER and E. FAURE-FREMIET

(J. Chim. phys., 1937, 34, 197—205).—X-Ray study shows that elastoidin fibres of the normal form I, of max. length and normal elasticity, have a definite structure, but always contain some amorphous material. Elastoidin II fibres, produced by heating form I at 62—67°, are highly elastic, of min. length, and amorphous. The change from I to II is likened to a fusion of the cryst. portion of I. Hydrolysis of elastoidin with warm H₂O or steam yields an amorphous material. J. W. S.

Diffraction of X-rays by old specimens of "frozen" rubber. W. H. BARNES (Canad. J. Res., 1937, 15, B, 156—158).—X-Ray diffraction data for two old (20—30 years) specimens of "frozen" rubber agreed with existing data for "frozen" and for stretched fresh rubber. On "thawing," the powder pattern of the diffraction diagrams of "frozen" rubber gave way to the single halo characteristic of unstretched fresh rubber. C. R. H.

Double thread structure of human tooth-enamel. J. THEWLIS (Naturwiss., 1937, 25, 283; cf. this vol., 118).—A reply to Schmidt (*loc. cit.*). Human tooth-enamel may consist of crystallites with different orientation enclosed within a single prism. A. J. M.

Orientation of crystallites in single [tooth-] enamel prisms. W. J. SCHMIDT (Naturwiss., 1937, 25, 283—284; cf. preceding abstract).—The double thread structure indicated by X-ray analysis of tooth-enamel is shown by an optical polarisation method to be due to the different orientation of crystallites in the two halves of the prism. A. J. M.

Structure of bones.—See A., III, 198.

Extension of the analytic method of analysis of electron diffraction photographs of gases. S. H. BAUER (J. Chem. Physics, 1937, 5, 368).—An extension of the author's previous analytic method (A., 1936, 1005) is given which permits the computation of the trends of the changes in the I/x curves when the l_j parameters undergo change. W. R. A.

Diffraction experiments with electrons of moderate energy. S. LORIA and J. KLINGER (Bull. Acad. Polonaise, 1937, A, 15—22).—Electron diffraction patterns for ZnO layers of uniform thickness with accelerating potentials of 16,000—4500 volts have been obtained. From the diameter of the rings and X-ray dimensions the λ of the electron beam is calc.; the de Broglie relation in this range is accurate to $\pm 0.4\%$. F. J. L.

Detection of submicroscopic crystal surfaces by electron diffraction. M. VON LAUE (Ann. Physik, 1937, [v], 29, 211—238; cf. A., 1936, 668).—Theoretical. The electron diffraction patterns obtained by Cochrane (*ibid.*, 1327) for thin films of Co and Ni and by Brück (*ibid.*, 784) for Ag and Ni skins are interpreted and reveal the presence of submicroscopic projections from the crystal surfaces.

Form of spot in electron diffraction pattern. V. A. KOLPINSKI (Physikal. Z. Sovietunion, 1937, 11, 356—358).—Theoretical. F. J. L.

Thermo-magnetic Nernst effect in cuprous oxide. M. M. NOSKOV (Physikal. Z. Sovietunion, 1937, 11, 307—319).—The thermo-magnetic Nernst coeff. (Q) for Cu₂O is -2.5×10^{-3} . Q calc. by the Sommerfeld equation (A., 1928, 467) agrees with the observed val., indicating that conduction takes place by means of free electrons or voids, but it is impossible from the sign of the effect, or of the Hall effect (positive), to decide which of these alternatives is correct. F. J. L.

Remanence in single crystals. K. J. SIXTUS (Physical Rev., 1937, [ii], 51, 780).—The magnetisation curve and data for a ring cut from an Fe single crystal, magnetised in the direction of its circumference, and having no demagnetising field, are reported. Results indicate that the true remanence in single crystals is not zero, and are consistent with Kaya's formula. N. M. B.

Magnetic energy and the thermodynamics of magnetisation. E. C. STONER (Phil. Mag., 1937, [vii], 23, 833—857; cf. A., 1935, 435).—Theoretical. N. M. B.

Piezo-electric effect of ammonium chloride crystals at the transition point -30.5° . S. BAHRS and J. ENGL (Z. Physik, 1937, 105, 470—477).—The piezo-electric modulus of NH₄Cl crystals is studied in the region of the -30.5° transition point. Within a range of 2° from this point the piezo-electric effect increases from 0 to its full low-temp. val. The modulus (d_{14}) of NH₄Cl is 0.337×10^{-8} . L. G. G.

Refractive index of strontium nitrate. M. L. YAKOWITZ and P. S. JORGENSEN (Ind. Eng. Chem. [Anal.], 1937, 9, 204).—For white light $n = 1.586$. E. S. H.

Paramagnetic rotatory power of hydrated ethyl erbium sulphate and paramagnetic saturation. J. BECQUEREL, W. J. DE HAAS, and J. VAN DEN HANDEL (Physica, 1937, 4, 345—352; cf. A., 1936, 1057).—The rotatory power (ρ) of Et Er sulphate in the direction of the optic axis has been determined for a range of magnetic field strengths (H) at 1.44—20.465° abs. and at const. H at 64.47—292.5° abs. $\rho = A \tanh(CH/T) + BH$, where A , B , and C are consts. Saturation is reached at low temp. R. S. B.

Reflective power of copper. L. CAPDECOMME and P. JACQUET (Compt. rend., 1937, 204, 1415—1417).—The reflective power (r) of Cu has been determined for $\lambda = 4500$ Å. Mechanical polishing gives discordant vals. of r which are 3—5% < the concordant vals. obtained by anodic polishing (cf. B., 1935, 730). In dry air at room temp. r is const. for anodically polished surfaces, but decreases for those mechanically polished. At 50° r for both surfaces decreases owing to the formation of oxide (removed by H₃PO₄, when r returns to the initial val.). The rate of decrease in r at 50° for anodic polishing is for mechanical polishing, and the former gives a true polycryst. surface. R. S. B.

Deformation sensitivity of metallic structures. U. DEHLINGER (Z. Physik, 1937, 105, 588—594).—Theoretical. The effects produced in metallic struc-

tures by drawing, rolling, and hammering are discussed and explained numerically on the basis of Jones' electron theory, with special reference to CuPd and AuCu. H. C. G.

Low-temperature transformation of heavy ammonium chloride. A. SMITS and G. J. MULLER (Nature, 1937, 139, 804).—Unlike NH_4Cl , which shows a heterogeneous transformation with hysteresis at -30° , ND_4Cl shows a homogeneous transition at -24° without hysteresis. L. S. T.

Polymorphic transitions of inorganic compounds to 50,000 kg. per sq. cm. P. W. BRIDGMAN (Proc. Nat. Acad. Sci., 1937, 23, 202—205; cf. A., 1936, 146).—35 compounds exhibited polymorphism; parameters (P , T , change of vol. and latent heat) are given for HgCl_2 , HgBr_2 (3), AgNO_2 , KCN (4), NaClO_3 (2), KIO_3 , TiClO_4 , RbClO_4 , AgClO_4 , AgIO_3 , Cu_2I_2 , Ag_2S , CsMnO_4 (2), ZnBr_2 , AgNO_3 (2), Pb(OAc)_2 (3), RbNO_3 , figures in parentheses indicating the no. of transitions when this is >1 . The temp. range was -79° to 200° . R. C. M.

Mol. wts. of large molecules and their determination. G. V. SCHULZ (Chem.-Ztg., 1937, 61, 285—288, 305—307).—The use of osmotic pressure, ultracentrifuge, and viscosimetric methods for the determination of the mol. wts. of proteins, cellulose, rubber, etc. is reviewed. Stress is laid on the definition of a mol. as the unit the atoms of which are united by main valencies; these physical methods may yield multiple results because the units may be aggregated by van der Waals forces. In such cases mol. wts. vary considerably with the solvent, its temp. and p_H . After chemical attack, e.g., acetylation, the chain lengths of mols. of rubber, starch, etc. remain unaltered. 49 references are given. S. M.

Specific resistance of tellurium. E. SCHMID and F. STAFFELBACH (Ann. Physik, 1937, [v], 29, 273—278).—The sp. resistance ρ of monocryst. Te is $\propto \cos^2 \phi$, where ϕ is the angle between the direction of the current and the principal axis of the crystal. Vals. at 20° are ρ_{11} 0.028₃ ohm per cm., and ρ_1 0.061₃ ohm per cm. These vals. and the corresponding val. of the anisotropy const. are $<$ those obtained by Bridgman (Proc. Amer. Acad. Arts Sci., 1925, 60, 305). The difference is ascribed to difference in purity of the Te. The experimental val. of ρ of quasi-isotropic polycryst. Te is $<$ that calc. from these vals., probably owing to imperfections in the crystal. O. D. S.

Change of electrical resistance of hardened platinum on tempering. W. MEISSNER (Ann. Physik, 1937, [v], 29, 264—272).—The decrease by tempering of the resistance of Pt hardened by strain takes place at temp. $<$ that at which the onset of recrystallisation was observed (cf. Feussner, A., 1927, 1016). The optimum tempering is obtained by 30 min. heating at 750° . At higher temp. an increase in r occurs again after a short time of heating. Pure Pt (containing traces of Cu and Ca) has at 1.3° abs. resistance $0.3 \times 10^{-3} r_0$, r_0 being the resistance at 0° . O. D. S.

Superconductivity. K. MENDELSSOHN (Physical Rev., 1937, [ii], 51, 781; cf. Slater, this vol., 174).—

Considerations and data bearing on a theoretical interpretation of superconductivity are examined.

N. M. B.

Transverse thermoelectric power in single crystals. H. REDDEMANN (Ann. Physik, 1937, [v], 29, 286—296; cf. Terada and Tsutsui, A., 1927, 717).—The predictions of the Thomson theory of the transverse thermoelectric effect in anisotropic single crystals are examined. Measurements of the thermoelectric power of Bi single crystals give vals. ± 39.3 mv. and ± 34.8 mv. per degree at -178° and -190° , respectively. O. D. S.

Thermomagnetic investigation of some cerous salts. (MLLE.) A. SERRES (J. Phys. Radium, 1935, [vii], 6, 336—339).—Weiss' law is obeyed by CeCl_3 from 291° to 480° abs., by $\text{Ce(NO}_3)_3 \cdot 5\text{H}_2\text{O}$ from 80.2° to 320.0° abs., and by $\text{Ce}_2(\text{C}_2\text{O}_4)_3 \cdot 2\text{H}_2\text{O}$ from 199.2° to 364° abs. Anomalies are observed for the last salt at 90.6° and 80.5° abs. Vals. of the magnetic moment n were respectively 12.45 ± 0.05 , 11.9 ± 0.1 , and 12.47 ± 0.05 Weiss magnetons and for the Curie temp. θ -22.9° , -16.7° , and -44° abs. O. D. S.

Paramagnetic susceptibility of lithium. S. R. RAO and S. SRIRAMAN (Proc. Indian Acad. Sci., 1937, 5, A, 343—350).—The paramagnetic susceptibility of Li, measured by the Curie method at various field strengths, is 2.6×10^{-6} e.m.u. The result is in accord with theoretical calculations of the paramagnetism of free electrons in alkali metals. J. W. S.

Magnetic susceptibility of mercury vapour. J. S. SHUR (Nature, 1937, 139, 804).—The at. susceptibility found for Hg is $\chi_a = -(78 \pm 7) \times 10^{-6}$. The diamagnetism of the two valency electrons of Hg is nearly equal to that of the ion. L. S. T.

Diamagnetic susceptibility of heavy water. V. NEHRA and M. QURESHI (Current Sci., 1937, 5, 533).—A precision determination with 99.5% pure D_2O , using the Gouy method, gave 0.638×10^{-6} at 29° . A tabular comparison of available vals. is made. N. M. B.

Dia- and para-magnetism in metallic mixed crystal series. IV. Method of calculation for the measurement of the paramagnetism of a dissolved transition metal. E. VOGT (Ann. Physik, 1937, [v], 29, 358—368; cf. A., 1934, 248).—The results of Gustafsson (A., 1936, 555) are considered. O. D. S.

Magnetic anisotropy of four-coordinated Co^{++} ions in crystals. K. S. KRISHNAN and A. MOOKHERJI (Physical Rev., 1937, [ii], 51, 774).—Results recently reported (cf. this vol., 229) are examined theoretically and extended by susceptibility data for $\text{Cs}_3[\text{CoCl}_4]\text{Cl}$. The anisotropy is 6.5%. N. M. B.

Paramagnetism at radio frequencies. C. J. GORTER (Physical Rev., 1937, [ii], 51, 778).—The magnetic susceptibility of paramagnetic alums, investigated by the heterodyne beat method, decreases considerably if a simultaneous strong const. magnetic field is applied in the direction of the alternating field. At 77° abs. the decreases for Fe, Cr, and V alums were approx. 75, 75, and 20%, respectively. A theoretical explanation is given. N. M. B.

Dispersion of sound velocity in liquids. B. V. R. RAO (Nature, 1937, 139, 885).—In CCl_4 the hypersonic velocity is $>$ the ultrasonic, whilst in COMe_2 the reverse is the case. L. S. T.

Application of Toeppler's method to the determination of the absorption of supersonic waves in liquids. F. A. KOROLEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 35—36).—The optical method of Toeppler can be applied. Results are given for the absorption of supersonic waves in C_6H_6 .

Emission of visible light from cavitated liquids. L. A. CHAMBERS (J. Chem. Physics, 1937, 5, 290—292).—The emission of visible light from 14 pure liquids under the influence of ultrasonics has been observed. The intensity of the emitted light is related to the η and dipole moment of the liquid, and to temp. The light originates in cavitated areas or at the surface of cavities and \propto the no. of cavities and the acoustic power input. W. R. A.

Absorption of sound in solid bodies. L. LANDAU and G. RUMER (Physikal. Z. Sovietunion, 1937, 11, 18—25).—Mathematical. The absorption of short sound waves is treated as the result of collisions between sound quanta and Debye's heat quanta. A linear variation of the absorption coeff. with frequency is deduced. O. D. S.

Calculation of the velocity of propagation of elastic waves in crystals. E. GOENS (Ann. Physik, 1937, [v], 29, 279—285). O. D. S.

Variations in the heat of evaporation at constant temperature. E. LEDOUX (Chim. et Ind., 1937, 37, 627—628).—A theoretical discussion on the influence of pressure on the latent heat of evaporation. C. R. H.

Fusion. M. VOLMER and O. SCHMIDT (Z. physikal. Chem., 1937, B, 35, 467—480).—The surface of a Ga crystal was locally superheated about 0.1° above the m.p. for about 1 hr. It seems that the melting of a crystal occurs, not by a simultaneous breaking up of the whole lattice, but by fusion starting at certain points and progressing from these. These points are, in general, points at which foreign substances depressing the m.p. have collected during formation of the crystal, or, when impurities are absent, loose places in the lattice. Extensive superheating is conceivably possible only in an ideal ionic lattice. R. C.

Specific heats of electrons of small metal particles at low temperatures. H. FROHLICH (Physica, 1937, 4, 406—412).—Theoretical. The sp. heat of the electrons of small metallic particles is calc. according to Sommerfeld's theory, and is only 26% of the val. for the bulk metal for dimensions of 10^{-6} cm. at 3° abs. if the metal contains free electrons. R. S. B.

Theoretical study of magnetic cooling experiments. M. H. HEBB and E. M. PURCELL (J. Chem. Physics, 1937, 5, 338—350).—The phenomenon of magnetic cooling produced by the method of adiabatic demagnetisation has been examined and discussed in the light of (a) electric cryst. fields acting on the ions of paramagnetic salts and (b) dipole interaction between these ions. The results provide a quant. theory of

magnetic cooling. There appears to be a divergence below 1° abs. between the empirical Curie scale of temp. and the thermodynamic scale, and a method of extrapolating the magnetic susceptibilities below this temp. has been developed following the method of Van Vleck (see below). W. R. A.

Effect of thermal pretreatment on molecular heat of condensed nitrous oxide. A. EUCKEN and H. VEITH (Z. physikal. Chem., 1937, B, 35, 463—466).—The mol. heat from 13° abs. upwards and the heat of fusion are not influenced by previous thermal treatment of the solid. It is inferred that the val. for the zero-point entropy found as the difference between the spectroscopic and thermal entropies represents some inherent property of N_2O and that the state of imperfect mol. arrangement in the crystal which gives rise to it is established during freezing, irrespective of its rate. R. C.

Calorimetric determination of the thermodynamic properties of saturated water in the liquid and gaseous states from 100° to 374° C. N. F. OSBORNE, H. F. STIMSON, and D. G. GINNINGS (J. Res. Nat. Bur. Stand., 1937, 18, 389—447).—Using improved apparatus, previous measurements (A., 1931, 31) have been extended up to within 1° of the crit. point. The efficiency of the apparatus was checked by sp. vol. measurements at 370° . Vals. of the heat contents of both phases and of the latent heat were obtained, and hence of the entropies and (in conjunction with v.-p. data) of the sp. vols. Tables of these quantities are given. The crit. temp. is estimated at 374.15° . F. J. G.

Influence of dipole-dipole coupling on the specific heat and susceptibility of a paramagnetic salt. J. H. VAN VLECK (J. Chem. Physics, 1937, 5, 320—337).—A method is developed for the evaluation of the mutual potential energy of a paramagnetic salt in a magnetically dil. solution due to dipole-dipole interaction, allowance being made for a feeble exchange coupling which may be significant even in a dil. system due to induction effects through normally non-magnetic atoms. The calculations also include the effect of a cryst. field. They can be used to determine the magnetic susceptibilities and sp. heats at temp. $<1^\circ$ abs. W. R. A.

Internal volume and entropy of vaporisation of liquids. O. K. RICE (J. Chem. Physics, 1937, 5, 353—358).—The effective internal vol. of a liquid, V_e , is defined as $\Delta S = R \log_e V_e/V_s$, where ΔS is the entropy of vaporisation and V_s is the molal vol. in equilibrium. ΔS is found to be expressible in terms of V_e/V and dV_e/dV , where V is the actual molal vol. of the liquid. Experimental data for 18 substances are considered and the reasons for the approx. validity of Trouton's and Hildebrand's rules are discussed. The relation between V , V_e , and the heat capacity of the liquid is considered. Entropies of vaporisation of associated liquids are usually high and reasons for this are suggested. W. R. A.

Specific heat of copper from 30° to 200° abs. S. M. DOCKERTY (Canad. J. Res., 1937, 15, A, 59—66).—Measurements of c_p at 28 intermediate

temp. were made with an accuracy approx. 0.05%. The characteristic temp. is a min. at approx. 50° abs., and a max. at approx. 105° abs. The results are compared with those of other workers. C. R. H.

Specific heat of dry manganous chloride. O. TRAPEZNIKOVA and G. MILJUTIN (Physikal. Z. Sovietunion, 1937, 11, 55—59; cf. this vol., 124).—Tabulated vals. of C_p , kg.-cal. per mol. of $MnCl_2$ between 14° and 130° abs. change from 1.59 to 13.94, respectively. No anomalies are observed in this region. O. D. S.

Entropies of *n*- and *iso*-butane, with some heat capacity data for *isobutane*. G. S. PARKS, C. H. SHOMATE, W. D. KENNEDY, and B. L. CRAWFORD, jun. (J. Chem. Physics, 1937, 5, 359—363).—The entropies of *n*- and *iso*- C_4H_{10} at 298° abs. calc. from the third law of thermodynamics are 75.8 and 70.0 g.-cal./degree/mol., respectively, vals. considerably < the corresponding vals. obtained by statistical methods. This indicates some serious fundamental error in one or other of the methods since the discrepancies are too great to be accounted for by errors in thermal data or in the extrapolations from liquid-air temp. down to 0° abs. The extrapolations down to 0° abs. have been critically examined and the thermodynamics of the isomerisation process are considered. W. R. A.

Variation of the entropy increase in quasi-adiabatic work processes with temperature and velocity of expansion. M. PAUL (Ann. Physik, 1937, [v], 29, 179—188).—Mathematical. An expression is derived for the gain in entropy in adiabatic expansion or compression of a gas due to the finite time occupied by the process. Vals. deduced from this expression constitute a lower limit for such entropy increase. O. D. S.

Calculation of the specific heat, enthalpy, and entropy of air. E. JUSTI (Ann. Physik, 1937, [v], 29, 302—305).—Data for C_p , for the mean sp. heat between 0° and t° , and for the entropy difference relative to 0° are tabulated from -100° to 2000°. An expression for the enthalpy difference between 0° and t° for pressure increase of 1 atm. is given. O. D. S.

Enthalpy diagram of nitrogen from 60 to 200 atmospheres. I. M. GUSAK (Physikal. Z. Sovietunion, 1937, 11, 60—68).—The isothermal expansion coeff. of N_2 has been determined between 60 and 200 atm. at 115.1°, 167.1°, 194.6°, 273.1°, and 291.6° abs. The enthalpy diagram of the U.S. Bureau of Mines has been continued up to 200 atm. O. D. S.

(A) The van der Waals and the Clausius characteristic equations. (B) Characteristic equations of imperfect gases. D. MILOSAVLEVITSCH (Bull. Soc. Chim. Yougoslav., 1936, 7, 79—85, 87—90).—Mathematical. R. T.

Expansion and pressure coefficients of nitrogen, hydrogen, helium, and neon, and the absolute temperature of 0°. J. OISHI (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 241—257).—Expansion and compression measurements were made between 0° and 100°. The coeffs. for H_2 , N_2 , and He are in good agreement with each other and lead to a

mean val. of 273.16° abs. for 0°. Discrepancies between the coeffs. were observed in the case of Ne. C. R. H.

Vapour pressure of caesium by the positive ion method. J. B. TAYLOR and I. LANGMUIR (Physical Rev., 1937, [ii], 51, 753—760; cf. A., 1933, 1098).—Data and corr. results on the positive ion currents from pure W filaments in saturated Cs vapour at bulb temp. -35° to 73° for filament temp. 1000—1800° abs. are given, and empirical expressions for the v.p. of solid Cs ($T < 302^\circ$ abs.) and liquid Cs ($T > 302^\circ$ abs.) are deduced. N. M. B.

Vapour pressure of phosphorus pentoxide. J. C. SOUTHARD and R. A. NELSON (J. Amer. Chem. Soc., 1937, 59, 911—916).—The existence of two cryst. modifications of P_2O_5 is confirmed. The low-temp. form has $\log_{10} p_{cm.} = -(5000/T) + 9.792$; the high-temp. form has $\log_{10} p_{cm.} = -(7930/T) + 11.113$; the liquid has $\log_{10} p_{cm.} = -(4320/T) + 6.809$. The atm. sublimation temp. for the low-temp. form is 358.9°. The triple point is at 45.6 cm. and 565.6°. The heats of vaporisation are 22,800, 36,200, and 19,700 g.-cal. per g.-mol., respectively. The heat of fusion is 16,500 g.-cal. per mol. P_2O_5 vapour condenses only as the low-temp. form. E. S. H.

Vapour pressure of salts of metals. D. N. TARASENKOV (Sci. Rep. Moscow State Univ., 1936, No. 6, 61—76).—The v.p. of $PbCl_2$ at 435—945°, of $CuCl$ at 430—107°, of $ZnCl_2$ at 516—728°, of $CdCl_2$ at 618—952°, and of $AgCl$ at 882—1120° have been determined. R. T.

B.p. and density of acetates of *n*-alcohols. M. WOJCIECHOWSKI and E. R. SMITH (Rocz. Chem., 1937, 17, 118—124, and J. Res. Nat. Bur. Stand., 1937, 18, 499—504).—The b.p. and d are: Me 56.32₃° and 0.927₃, Et 77.11₄° and 0.8946₈, Pr 101.54₈° and 0.8830₃, and Bu acetate 126.09₄° and 0.8763₆; the increment in dp/dt per CH_2 group of the alcohol is 0.0028. R. T.

Curvature of the density diameter. E. MATHIAS (Compt. rend., 1937, 204, 1097—1099).—A discussion of previous results (A., 1900, ii, 711). The density "diameters" of 30 substances having high T_c are parabolic, and cannot be superposed by change of scale. Ten gases having low T_c give rectilinear diameters. A. J. E. W.

Dependence of the thermal expansion coefficients of silver haloids on temperature. P. G. STRELKOV (Nature, 1937, 139, 803—804).—Curves showing the expansion coeff. of single crystals of NaCl, AgCl, and AgBr as a function of the m.p. reveal an abnormal increase near the m.p. This behaviour is connected with the behaviour of the crystal lattice as is also shown by jumps in the electrical conductivities at the m.p. L. S. T.

Anomalous expansion of zinc and cadmium near the m.p. W. F. HACHKOVSKY and P. G. STRELKOV (Nature, 1937, 139, 715—716).—Anomalous expansion occurs and its sign coincides with the change in vol. on melting. L. S. T.

Heat-conductivity of gases at high temperatures. I. K. H. RIEWE and R. ROMPE (Z.

Physik, 1937, 105, 478—486).—Theoretical. A calculation of that part of the conduction of heat in gases dependent on kinetic energy and dissociation and ionisation energies. L. G. G.

Regularities in the heat-conductivity of metals. G. BORELIUS (Ann. Physik, 1937, [v], 29, 251—255).—The results of Bremmer and de Haas (A., 1936, 1059) and of Gruneisen and Reddemann (A., 1934, 1291) are considered. O. D. S.

Variation in the heat-conductivity of metals in transverse magnetic field. M. KOHLER (Ann. Physik, 1937, [v], 29, 256—263).—Mathematical. The adiabatic variation of the conductivity *i* at high temp. is investigated on the basis of electron theory. For low field strength *i* is inversely $\propto H^2$ and T^{-2} . *i* has a limiting val. at high field strengths. The Wiedemann-Franz law is obeyed. O. D. S.

Compressibility of liquids and a method of obtaining the compressibility of molecules. D. B. MACLEOD (Trans. Faraday Soc., 1937, 33, 694—707).—The vol. of a liquid under compression is very accurately given by $\pi_0(v_0 - b)/(P_e + \pi_p) + K/(P_e + \pi_p + P_m) + b_a$, in which the first term denotes the vol. of the free space (*v* - *b*) as determined by Boyle's law, using the sum of the internal (π) and external (P_e) pressures; the second term (P_m = internal pressure of a mol.) represents the compressibility of the mols., i.e., the vol. of the interat. space in the mols.; and *b_a* is the vol. of the atoms in the mol., assumed incompressible. Using vals. for the free space calc. from viscosity measurements, and Bridgman's experimental data for pressure and vol., it is shown that the vol. of the mols. obtained by subtracting (*v* - *b*) from the total vol. of liquid agrees very closely with that calc. by two independent methods. These vols. show a decrease of the order of 20% between 0 and 12,000 atm. for CS₂, C₅H₁₂, Et₂O, and EtI, but only a small decrease (2.5%) in the case of Hg. F. L. U.

Viscosity of liquid selenium. S. DOBINSKI and J. WESOŁOWSKI (Bull. Acad. Polonaise, 1937, A, 7—14).—The viscosity of liquid Se has been measured between 215.7° and 345.8° using an Ostwald type viscosimeter; the variation with temp. is regular, but the deviation from Andrade's law (cf. A., 1934, 356) is $\pm 8\%$, indicating strong association. F. J. L.

Internal friction in some solid dielectric materials. A. GEMANT and W. JACKSON (Phil. Mag., 1937, [vii], 23, 960—983).—An investigation of the internal damping of ebonite, trolitul, quartz, glass, and wood for the frequency range 0.3—10 cycles per sec., using the methods of free torsional and free lateral vibrations, disproves the classical assumption that the friction is of a viscous character. The classical η const. varies, to a first approximation, inversely as the frequency, corresponding with a const. energy loss per cycle, and probably to be explained in terms of solid friction. An alternative explanation based on complex viscosity is considered. In general, for 20—180°, the elasticity modulus decreases and damping increases with rise of temp. N. M. B.

Glass. XV. Viscosity and rigidity of glucose glass. G. S. PARKS and J. D. REAGH (J. Chem.

Physics, 1937, 5, 364—367).—The rigidity and η of fine glucose threads have been examined by substituting them for the phosphor-bronze suspension of a D'Arsonval galvanometer and subjecting them to electro-magnetic torsion. The properties depend on the extent of annealing and on their previous working and it is therefore concluded that the amorphous matter exists in a variety of glassy states having different properties rather than in a single glassy state. W. R. A.

Ultra-violet absorption of binary liquid mixtures. XII. M. PESTEMER, H. FLASCHKA, and R. SKRABAL (Z. Elektrochem., 1937, 43, 297—302; cf. this vol., 72).—Beer's law is not valid for mixtures of CS₂ with C₆H₁₄ and of CS₂ + COMe₂ with C₆H₁₄. A discussion of these and previously published results leads to an explanation based on the assumed formation of complexes. F. L. U.

Dielectric polarisation of binary mixtures and the relation to their constitution. R. KREMANN and O. FRUHWIRTH (Österr. Chem.-Ztg., 1937, 40, 226—234).—A review. E. S. H.

Dielectric study of compound formation in binary mixtures, with special reference to the systems diethyl ether-chloroform, acetamide-phenol, and iodoform-quinoline. O. FRUHWIRTH and E. MAYER-PITSOH (Z. Elektrochem., 1937, 43, 304—309).—Polarisation-composition curves are given for Et₂O-CHCl₃, NH₂Ac-PhOH, and CHI₃-quinoline. The two first show only slight departure from additive behaviour and give no indication of the compound formation suggested by other properties. The third system shows a marked discontinuity corresponding with CHI₃.3C₉H₇N (I), and the same type of curve is obtained for mixtures of the pure components as for solutions in CCl₄. (I) is therefore present as such in dil. solution in a relatively undissociated condition. F. L. U.

Effect of carbon disulphide as solvent on electric moment of solvent. F. E. HOECKER (J. Chem. Physics, 1937, 5, 372—373).—The electric moment of EtOH in CS₂ is 1.51D compared with 1.70D in C₆H₆ and 1.67D in CCl₄. It is improbable that this discrepancy is due to chemical action between the CS₂ and the condenser material, since Higasi finds a corresponding discrepancy for CS₂ solutions of Pr^oOH and Bu^oOH using a Pt condenser. Special precautions were taken to remove H₂O vapour from the solvent. W. R. A.

Electrical birefringence of mixtures of nitrobenzene and hexane in the neighbourhood of the critical solution temperature. L. KOZŁOWSKI (Bull. Acad. Polonaise, 1936, A, 575—585).—The Kerr const. is approx. a linear function of the temp. in the vicinity of the crit. solution temp. (51.2° PhNO₂, 16.5°). F. J. L.

Viscosity-concentration relations in concentrated solution and their energetic significance. III. R. HOUWINK and K. H. KLAASSENS (Kolloid.-Z., 1937, 79, 138—148).—Theoretical. A new empirical formula, applicable up to the highest concns. hitherto studied, and equally valid for widely

different substances, is proposed. Its relation to other formulæ is discussed (cf. this vol., 303).

F. L. U.

Viscosity of the system $K_2B_4O_7$ - B_2O_3 in the fused state. M. P. VOLAROVITSCH and R. S. FRIDMAN (J. Phys. Chem. Russ., 1937, 9, 177—181).—Measurements have been made at 600—1100°. The vals. of η for B_2O_3 , together with those found by Parks and Spaght at <600° (A., 1935, 1313), are represented by $\log (\eta/2.114) = 1450/(t - 150.8)$. The η isothermals indicate the existence of a compound $K_2O.3B_2O_3$.

E. R.

Viscosity of the systems (A) phenol-methyl- and -dimethyl-aniline. A. D. VINOGRADOVA and N. N. EFREMOV. (B) phenol-ethyl- and -diethyl-aniline. A. M. TICHOMIROVA and N. N. EFREMOV (Bull. Acad. Sci. U.R.S.S., 1937, 143—156, 157—170).—The composition-f.p., $-d$, $-\eta$, $-temp.$ coeff. of η , and $-surface$ tension curves afford no evidence for compound formation.

R. T.

Validity of Raoult's law for paraffin molecules of very different length. J. H. HILDEBRAND (J. Amer. Chem. Soc., 1937, 59, 794—798).—Theoretical. The meagre published evidence supports the ideal character of binary paraffin solutions.

E. S. H.

Theory of concentrated solutions. XV. F.p. of aqueous solutions of organic compounds. M. EWERT (Bull. Soc. chim. Belg., 1937, 46, 90—103).—F.p. data for aq. solutions of MeOH, EtOH, Pr^iOH , C_3H_5OH , $COMe_2$, MeCN, dioxan, $(CH_2OH)_2$, NEt_3 , C_5H_5N , and piperidine (I) are given. The compound MeOH, H_2O probably exists and there is a eutectic mixture, m.p. about -125° , containing approx. 75 mol.-% of MeOH. The compounds $(CH_2OH)_2.2H_2O$ and, probably, $3(CH_2OH)_2.2H_2O$ are indicated and the eutectic mixtures, m.p. -51° , -63° , and -49° , contain approx. 29, 47, and 61 mol.-% of $(CH_2OH)_2$, respectively. The compound $2(I).H_2O$, m.p. -12° , exists, and the eutectic mixtures, m.p. -32° and -16° , contain approx. 33 and 82 mol.-% (I), respectively.

J. G. A. G.

System benzylcellulose-benzene-ethyl alcohol. I. W. L. H. MOLL and G. W. FULLER (Kolloid-Z., 1937, 79, 209—212).—Benzylcellulose (I) forms clear homogeneous solutions in C_6H_6 -EtOH mixtures with 10—20 mol.-% of EtOH. Property-composition relations for the solvent mixture and for a 5.5% solution of (I) have been determined at 20° in the case of the dielectric const., n , d , and σ , and the "mass moment" (A., 1936, 1199) of (I) has been calc. Whatever mol. wt. be assigned to (I), its mass moment increases uniformly with $[EtOH]$.

F. L. U.

Study of non-aqueous solutions by methods of physico-chemical analysis. M. A. KLOTCHKO (Bull. Acad. Sci. U.R.S.S., 1937, 225—252).—Theoretical.

R. T.

Properties of the metallic state. I. Metallic hydrogen and its alloys. II. Metallic hydrogen and deuterium. A. R. UBBELOHDE (Proc. Roy. Soc., 1937, A, 159, 295—313).—I. H_2 dissolved in metals is present in the metallic state, i.e., dissolved as atoms and partly dissociated into protons and

electrons. The co-existence of two solid solutions with the same structure in equilibrium is connected with the fact that heat of dissolution of H_2 depends on vacant electron levels in the metal. Hysteresis effects in the same system are discussed in relation to a modified phase rule.

II. A difference is found in the expansion of the lattices of β -Pd-H and Pd-D. Electrical resistance measurements are recorded. The solubility of D, is > that of H_2 . It is inferred that D is less ionised than H in the alloy.

G. D. P.

Stereo-chemical compression of sodium, potassium, and rubidium by combination with gold. W. BILTZ and F. WEIBKE [with U. VON QUADT and H. J. EHRHORN] (Z. anorg. Chem., 1937, 232, 313—318).—The characteristic increments of vol. due to Na, K, and Rb in combining with Au are somewhat < with Hg, Sn, Pb, Cd, and graphite, and very much < the at. vols. (cf. A., 1935, 1199).

F. J. G.

Composition-mechanical property diagrams of the system copper-zinc. S. I. GUBKIN and P. A. ZACHAROV (Bull. Acad. Sci. U.R.S.S., 1937, 41—69).—The curves connecting hardness and sp. flow pressure with temp. and composition, and resilience with composition, at 20—850° are of the same general shape. Alloys containing 12% Zn have the greatest mechanical strength at room temp. and high temp.

R. T.

Energy of the superlattice in β -brass. N. F. MOTT (Proc. Physical Soc., 1937, 49, 258—263).—An estimate, based on the electron theory of metals, of the energy of the superlattice in β -brass agrees in order of magnitude with the energy absorbed in the transition from the ordered to the disordered state.

N. M. B.

Magnetic properties of manganese amalgams. L. F. BATES and L. C. TAI (Proc. Physical Soc., 1937, 49, 230—236; cf. A., 1936, 1329).—The variation with temp. of the magnetic susceptibilities of amalgams containing, respectively, 0.0016, 0.016, and 0.03 g. of Mn per 100 g. of Hg has been determined and plotted for 15—350°. Marked temp. hysteresis is shown, and the Mn becomes more paramagnetic with rise of temp. until a steady state is reached in the case of the more conc. amalgams. Theoretical aspects are discussed.

N. M. B.

X-Ray analysis of the nickel-aluminium system. A. J. BRADLEY and A. TAYLOR (Proc. Roy. Soc., 1937, A, 159, 56—72).—The three phases described are: (i) $NiAl_3$, orthorhombic with 16 atoms per unit cell, (ii) Ni_2Al_3 , trigonal with 5 atoms per unit cell, (iii) a body-centred phase with a max. lattice spacing at the composition $NiAl$. The solid solution of Al in Ni is characterised by a field of immiscibility at room temp. The $NiAl$ structure takes up Ni by substitution; with excess of Al change in composition is associated with the dropping out of Ni atoms, leaving some lattice points unoccupied.

G. D. P.

X-Ray investigation of pure iron-nickel alloys. III. Thermal expansion of alloys rich in iron. IV. Variation of the lattice parameter with composition. V. Variation of thermal expansion with composition. E. A. OWEN and E. L. YATES

[IV and V with A. H. SULLY] (Proc. Physical Soc., 1937, 49, 307—314, 315—322, 323—325; cf. this vol., 232).—III. Lattice parameters of pure Fe and Fe-Ni alloys in the α phase were measured from room temp. to 600° and coeffs. of expansion are calc. The lattice parameter of 99.97% Fe at 15° is 2.8605 Å., and the coeff. of expansion 10.7×10^{-6} . At all temp. the addition of Ni to Fe at first lowers and then increases the val. of the coeff.

IV. Data for 20 alloys in the γ phase with 23—97 at.-% Ni and four alloys in the α phase with 3—16 at.-% Ni are given for temp. $>600^\circ$. At room temp. the addition of Fe expands the Ni lattice almost linearly with at. composition until the parameter reaches a max. val. 3.5895 Å. at 39 at.-% Ni, beyond which the lattice contracts. The parameters of the γ alloys are used to calculate the densities of alloys over the range pure Fe—pure Ni.

V. Curves for the variation of the coeff. of expansion with composition of the γ alloys agree in general with the results of Guillaume and Chevenard. Divergencies are probably due to differences in the purity of the alloys. N. M. B.

Widmanstätten structure. VIII. The γ - and α -transformation in iron-nickel alloys. R. F. MEHL and G. DERGE (Amer. Inst. Min. Met. Eng., 1937, Tech. Publ. 797, 15 pp.).—Transformation from the face-centred cubic lattice of γ -Fe to the body-centred cubic lattice of α -Fe has been studied crystallographically in alloys of Fe containing 27—34% Ni and in a Cañon Diablo meteorite. R. B. C.

Interpretation of the eutectoid diagram Fe-Fe₃C. P. DEJEAN (J. Phys. Radium, 1935, [vii], 6, 525—531).—A criticism of Seigle (cf. A., 1934, 353). N. M. B.

Identification of different phases in iron-palladium alloys by magnetic and X-ray methods. R. HOCART and M. FALLOT (Compt. rend., 1937, 204, 1465—1467).—Mixtures containing 5—40 at.-% Fe exhibit two Curie points at 764° and 432° which correspond with two series of solid solutions. At >40 at.-% Fe quite different properties are shown, and alloys annealed for a long time (100 hr.) between 800° and 400° give two Curie points corresponding approx. with FePd (48 at.-% Fe) and FePd₃ (74%). Supporting evidence for these two phases is obtained from X-rays and their nature is discussed. W. R. A.

Platinum-ruthenium alloys. V. A. NEMLOV and A. A. RUDNITZKI (Bull. Acad. Sci. U.R.S.S., 1937, 33—40).—Hardness, conductivity, and micro-structure show that the system consists of a series of solid solutions. R. T.

Phase boundaries in binary alloys. I. Equilibrium between liquid and solid phases. II. Theory of the α , β phase boundaries. H. JONES (Proc. Physical Soc., 1937, 49, 243—249, 250—257).—I. A thermodynamic study of the m.-p. and f.-p. curves in the α solid-solution region shows that the van 't Hoff relation should apply to these alloys, and its validity for dil. solutions is verified by comparison with experiment. The change of latent heat when small quantities of Ni, Zn, Ga, or Ge are

dissolved in Cu, or Cd, In, or Sn in Ag, ∞ electron:atom ratio. A qual. theory is proposed.

II. A quant. theory of the phase boundaries in alloys between the face-centred and body-centred cubic structures is given and applied in detail to Cu alloys. The approx. width of the $\alpha + \beta$ mixed-crystal region is computed; it decreases with increasing valency of the solute element. The variation with temp. of the limits of the α and β regions is computed. Results show fair agreement with experiment. N. M. B.

Binary systems of phenol with some hydrocarbons. R. VONDRAČEK (Coll. Czech. Chem. Comm., 1937, 9, 168—175).—The observed crit. solution temp. and the % of hydrocarbon are n -C₅H₁₂, 56.6°, 53.0%; *iso*-C₅H₁₂, 69.05°, 51.2%; n -C₆H₁₄, 52.6°, 52.2%; *iso*-C₆H₁₄, 57.2°, 50.4%; n -C₇H₁₆, 52.9°, 51.5%. The peritectic point temp. rises slightly (31.9—34.2°) with increasing mol. wt. of the paraffin. The solubility of cryst. PhOH in the hydrocarbons at 20°, 25°, and 30° has been determined and shown to depend only slightly on the mol. wt. of the hydrocarbon. Methylcyclohexane and liquid PhOH are miscible in all proportions. C. R. H.

Solubility of lithium and sodium fluorides. J. H. PAYNE (J. Amer. Chem. Soc., 1937, 59, 947).—Solubilities have been re-determined at 0°, 25°, and 35°. E. S. H.

Action of homonymous ions. N. A. TANANAEV and A. T. PILIPENKO (J. Appl. Chem. Russ., 1937, 10, 549—556).—The solubility of PbCl₂ is a min. in N -HCl or $-KCl$, and that of TlCl in $2N$ -HCl; that of HgI rises rapidly with increasing [KI], and is doubled in 0.001*N*-KI. R. T.

Distribution experiments on trimethylethylene and methylethylene between carbon tetrachloride and aqueous phase. Y. P. LIU and T. C. WEI (J. Chinese Chem. Soc., 1937, 5, 41—43).—The distribution coeff. of each olefine between CCl₄ and 0.1*N*-KNO₃ increases with [KNO₃] (cf. A., 1936, 1210). J. G. A. G.

Partition coefficient between neutral glycerides (or the corresponding fatty acids) and water of substances soluble in all proportions in the two solvents. *tert*.-Butyl alcohol. A. LINDENBERG (Compt. rend. Soc. Biol., 1937, 125, 138—140). H. G. R.

Adsorption isotherms of hydrogen on charcoal between 90° and 50° abs. in connexion with desorption experiments. A. VAN ITTERBEEK and W. VAN DINGENEN (Physica, 1937, 4, 389—402).—Adsorption isotherms have been determined for Desorex B and Carbotox charcoals at 54.7—90.05° abs. The calc. heat of adsorption decreases hyperbolically with increase in pressure at const. temp., and at const. pressure decreases with fall of temp. The changes of temp. produced by desorption are compared with those calc. from the heats of adsorption. It is estimated that the crit. point of H₂ may be reached by desorption from 2.5 atm. at 67° abs. R. S. B.

Adsorption of hydrogen, carbon dioxide, and methyl alcohol on zinc oxide. G. SARTORI

(Gazzetta, 1937, 67, 69—85).—The adsorption isotherms of H_2 , CO , CO_2 , and $MeOH$ on ZnO have been measured at 0° , 36° , 76° , 106° , and 120° . The data for H_2 and CO agree with the Langmuir equation, but CO_2 and $MeOH$ show deviations due to chemical adsorption and capillary condensation, respectively. The calc. heats of adsorption for H_2 , CO , CO_2 , and $MeOH$ are 11,000, 22,000, 7000, and 9000 g.-cal. per mol., respectively, at 18° , and for the first three substances, 3000, 4200, and 2200 g.-cal. per mol., respectively, at 113° . The kinetic nature of the adsorption process is discussed. O. J. W.

Adsorption of hydrogen, carbon monoxide, and carbon dioxide on zinc oxide at the temperature of synthesis of methyl alcohol. G. SARTORI (Gazzetta, 1937, 67, 98—104; cf. preceding abstract).— H_2 and CO are more strongly adsorbed on ZnO at 430° than at 0 — 120° ; this is partly due to activated adsorption and partly due to diffusion into the interior of the adsorbent. CO_2 is less adsorbed at 430° , because chemical adsorption can no longer take place at this temp. and because diffusion does not occur so readily. O. J. W.

Dielectric properties of solvents and adsorption by mineral suspensions. N. F. JERMOLENKO and E. N. NOVIKOVA (Kolloid. Shurn., 1936, 2, 179—186).—Adsorption of picric acid, $BzOH$, and methylene-blue from H_2O , alcohols, CO_2Me_2 , etc. by three clay varieties and animal charcoal was measured. The adsorptive power varies in the same order as the catalytic activity of the adsorbents towards H_2O_2 . The vol. of liquid adsorbed from the saturated vapour of pure solvents is const. for each adsorbent, irrespective of the liquid. J. J. B.

Adsorption of ions, and the potential rise at the interface solid electrolyte-solution. V. M. VDOVENKO (Sci. Rep. Leningrad State Univ., 1936, 2, No. 2, 48—102).—The potential rise at the boundary $AgCl$ or $AgI/0.01$ — $0.1N$ - $AgNO_3$, $-KCl$, or $-KI \propto \log [Ag^+]$, $[Cl^-]$, or $[I^-]$, and to the amount of adsorbed ions. The amount of Ra in g.-mols. adsorbed per sq. cm. of glass surface from solutions containing 0.001 — 10 p.p.m. Ra , at p_H 2—7, is given by $K + 0.5 \log (10^{-0.57(p_H - 3)} C \times 10^{0.86 p_H})$, where K is a const., and C is the initial $[Ra]$. R. T.

Application of the Volmer equation of state to the derivation of the Langmuir adsorption isotherm. V. SIHVONEN (Suomen Kem., 1937, 10, B, 14).—If the Volmer equation of state is used in the thermodynamic derivation of the adsorption isotherm, a relation identical with the Langmuir isotherm is obtained. M. H. M. A.

Effect of adsorption layers on the properties of disperse systems. P. REHBINDER (Bull. Acad. Sci. U.R.S.S., 1936, 639—706).—The froth-forming effect of surface-active substances (measured by the life period of bubbles and the depth of froth) depends on the concn. in the adsorption layer, and on its mechanical properties. Surface-active substances have sometimes much stronger stabilising or coagulating effects on aq. suspensions than electrolytes; the action depends on the formation or destruction of the aq. envelope on the surface of the particles, under the

influence of the surface layer. Suspensions of hydrocarbons surrounded by surface-active compounds are particularly stable in consequence of the formation of a two-dimensional surface compound. The decrease in strength of solid substances is due to the splitting effect of thin liquid layers. F. J. L.

Effect of the adsorption layer on the wetting phenomena in the flotation process. P. REHBINDER (Bull. Acad. Sci. U.R.S.S., 1936, 707—740).—The adsorption layer on the surface of solid particles suspended in H_2O produces a strongly hydrophobic surface, resulting in an abrupt decrease of "wettability," which increases the floatability; a decrease of surface tension brought about by a froth-forming substance, or accumulation of surface-active material, reduces the floatability. F. J. L.

Properties of thin liquid layers and their influence on the interaction with solid surfaces. B. DERJAGUIN and M. KUSAKOV (Bull. Acad. Sci. U.R.S.S., 1936, 741—753).—The relation between the pressure of a thin liquid film and its thickness is determined, and used to explain certain surface phenomena—stabilisation and coagulation of disperse systems, swelling of lyophilic colloids, etc. F. J. L.

Electrocapillary phenomena and the wetting capacity of metals. B. KABANOV and N. IVANISCHTSCHENKO (Bull. Acad. Sci. U.R.S.S., 1936, 755—771).—The wettability of Hg is increased by the presence of surface-active compounds, especially for potentials near the max. of the electrocapillary curve. F. J. L.

Heat of wetting of Al_2O_3 , Fe_2O_3 , MgO , and SiO_2 gels. T. D. POZDNIKOVA (Sci. Rep. Leningrad State Univ., 1936, 2, No. 2, 103—120).—The heat of wetting of the gels by H_2O , $EtOH$, or C_6H_6 is a max. when the structural H_2O content of the gels is greatest, and hence varies according to the heat of activation. R. T.

Laminary systems. XI. Formation and properties of thin sulphur films on the surface of copper chloride solutions. S. G. MOKRUSCHIN, E. J. KRILOV, and G. F. CHOVIKOVA (Kolloid. Shurn., 1937, 3, 35—44).—The film formed by H_2S on the surface of aq. $CuCl_2$ is permeable to H_2S (cf. this vol., 26); its thickness increases indefinitely. It crystallises after some hr. J. J. B.

So-called "transition temperature" of metallic films. T. FUKUROI (Nature, 1937, 139, 884).—The influence of temp. on the electrical resistance of thin films of Cd condensed on glass has been studied. The so-called "transition temp." becomes less distinct when the thickness of the films reaches several hundred $m\mu$. When the films are not too thin the thickness is found to be linearly related to the log of the transition temp. In the case of Zn , Cd , Mg , and Sb , the ratio of this temp. to the m.p. ranges from 0.36 to 0.41. L. S. T.

Built-up films of proteins and their properties. H. NEURATH (Science, 1937, 85, 289—290).—A criticism (cf. this vol., 180). L. S. T.

Viscosity of unimolecular surface layers. D. G. DERVICHIAN and M. JOLY (Compt. rend., 1937, 204, 1318—1320).—Measurements have been made

of the rate of flow through a channel between two liquids each of which is covered by a unimol. film of the same substance. Data are recorded for films of stearic and oleic acids on 0.01N-HCl, and for triolein and tribenzoin on distilled H_2O . H. J. E.

Change in interfacial tension in the neighbourhood of saturation. F. BARILLET and (MILE.) A. CHOISNARD (Compt. rend., 1937, 204, 1418—1419).—The distribution of a salt between two phases is discussed in terms of the saturation or super-saturation of the phases. Experiments with oleic acid and salt solutions are described. R. S. B.

Mechanism of flotation. Fixing of particles on the boundary between water and air bubbles. Z. V. VOLKOVA (J. Phys. Chem. Russ., 1937, 9, 182—189).—A theoretical discussion of the conditions under which powders are fixed at the boundary. The mechanism of fixing consists in (a) the destruction of the H_2O layer between the particles and air bubbles, and (b) the drawing of the particle into the air phase until an equilibrium position is reached. E. R.

Effect of radiation on oil drops. W. STENSTROM and I. VIGNES (J. Chem. Physics, 1937, 5, 298—301).—When irradiated by β -, X-, or ultra-violet rays, oil drops on a H_2O surface increase in diameter to an extent which depends on the duration of irradiation. The effect may be due to oxidation of the oil with formation of long-chain acidic mols. which tend to spread as unimol. films. W. R. A.

Polarisation studies in collodion membranes and in synthetic protein-lipoid membranes. M. SPIEGEL-ADOLF (J. Gen. Physiol., 1937, 20, 695—710).—The effect of various agents and conditions on membranes of high polarisability and low resistance, made either by the addition of phosphatides or other Et_2O -sol. substances to collodion, or by drying the collodion films rapidly under pressure, or by depositing protein-lecithin films on sintered glass filters, is described. F. A. A.

Electro-osmotic studies of diaphragms. A. I. JURSHENKO (Sci. Rep. Leningrad State Univ., 1936, 2, No. 2, 121—161).—The ζ -potential of diaphragms (gelatin, cellulose, porcelain, bakelite paper, sintered glass) does not run parallel with the change in the transport nos. of ions in the pores. Increase in the diameter of the pores leads to an increase in the ζ -potential to a limiting val.; at the same time the ionic effects diminish. R. T.

Method for investigation of electrostenolysis. E. S. FETCHER, jun., R. S. LILLIE, and W. D. HARKINS (J. Gen. Physiol., 1937, 20, 671—683).—The phenomenon of electrostenolysis is re-defined as the oxidation and reduction of an electrolyte at opposite surfaces of a high-resistance membrane separating the electrodes of an electrolytic cell. An apparatus and technique for studying the phenomenon are described. With Fe^{II} - Fe^{III} solutions, and a cellulose acetate membrane, the potential drop across the membrane must be >2150 volts per cm. to effect oxidation and reduction. The no. of equivs. oxidised per faraday is $\sim 10^{-3}$. F. A. A.

Periodic precipitation of barium carbonate, copper chromate, and silver sulphate in aqueous media in capillaries. F. M. SCHEMJAKIN and A. I. LAZAREVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 513—515). F. L. U.

Comparison of periodic precipitation in aqueous media by the Morse and Ostwald methods. F. M. SCHEMJAKIN and A. I. LAZAREVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 517—520).—No important difference is noted between the rhythmic pptn. of PbI_2 and $HgCO_3$ by the Morse (thin film between plane surfaces) and Ostwald (capillary tube) methods. The periodicity consts. are slightly lower in the latter. The results are not affected by interchanging the positions of the reacting solutions. F. L. U.

Emission wave theory of periodic reactions. VII. F. M. SCHEMJAKIN (Sci. Rept. Moscow State Univ., 1936, No. 6, 89—97).—For limiting concns. at which it is still possible to obtain Liesegang rings, the periodicity coeff. $K - \lambda v$, where λ is the distance between successive rings, and v is the velocity of propagation. The best defined rings are obtained when $K - \lambda v/4$. The ratio of the K of two reactions with the same internal reagent is inversely \propto that of the mol. wts. of the external reagents, or of the reaction products. For a given reaction $K = 1.1 + 22.3e^{-0.9c}$, where c is the % concn. of gelatin or agar-agar. R. T.

Diffusion of gases emerging from tubes, and chemical consequences of the turbulence thereby set up. P. RENAUD and G. COSTEANU (J. Chim. phys., 1937, 34, 141—148).—When a current of diluted reactive gas (H_2S + air) issues from a capillary tube, and impinges normally on a plate covered with a suitable reagent, e.g., $Pb(OAc)_2$, reaction does not take place uniformly, but in a series of concentric rings. The effect of varying the conditions is described. It is considered that only when the motion becomes turbulent can sufficient mols. reach the reagent to give a visible trace. F. A. A.

Relation between sedimentation volume of particles of microscopic size and activity coefficients of electrolytes. A. VON BUZAGH (Kolloid-Z., 1937, 79, 156—160).—In conformity with the view that the sedimentation vol. must increase with the degree of adhesion of the component particles (more space being occupied by irregular aggregates than by the equiv. no. of independent particles), complete parallelism is found between the influence of ionic activity on adhesion (A., 1936, 1064) and on sedimentation vol. for suspensions of quartz particles of radius 25–6 μ . F. L. U.

Volume of coagula in sedimenting and centrifuging. H. A. WANNOW and K. HOFFMANN (Kolloid-Z., 1937, 79, 160—174; cf. preceding abstract).—The decrease in the vol. of coagula of Congo-rubin and of As_2S_3 with time has been studied for a variety of coagulating electrolytes. In sedimentation experiments the vol. is largely determined by the structural form of the aggregates, which in turn depends on the mutual adhesion of the particles. In centrifuging, with acceleration >500g, the differ-

ences observed in sedimentation under gravity do not occur, owing to breakdown of the structures.

F. L. U.

Elementary processes in aerosols. S. V. GORBATSHEV (Bull. Acad. Sci. U.R.S.S., 1936, 843—873).—A discussion of the factors which affect the degree of dispersion in aerosols. F. J. L.

New type of tungsten oxide sol. II. F. EIRICH (Kolloid-Z., 1937, 79, 182—190; cf. A., 1935, 296).—Sols prepared by peptisation of WO_3 with aq. Na_2WO_4 at the b.p. of the solution, and subsequent purification by electrodialysis and electro-decantation, have been examined by conductometric and potentiometric titration methods. The results are recorded, and discussed with reference to the chemical nature of the stabilising group.

F. L. U.

Hydrogels. XIII. System manganous oxide-water. A. SIMON [with H. FROHLICH]. **XIV. Magnetic characterisation of manganous hydroxide.** W. H. ALBRECHT (Z. anorg. Chem., 1937, 232, 369—381, 382—392).—XIII. $Mn(OH)_2$ cryst. from hot $NaOH$ is identical with natural pyrochroite (hexagonal, a 3.34, c 4.68 Å.). Tensimeter curves suggest the existence of a hemihydrate, but X-ray diagrams of partly-dehydrated products show only the lines of MnO and $Mn(OH)_2$. For $Mn(OH)_2 \rightarrow MnO + H_2O$ $Q = 19.5$ kg.-cal.

XIV. Susceptibilities of cryst. $Mn(OH)_2$ and of partly dehydrated products have been measured down to liquid air temp. No evidence for a hemihydrate was obtained (see above). Vals. for $Mn(OH)_2$ are in approx. agreement with theory for the Mn^{2+} ion. There are indications of a transition point in MnO at -150° .

F. J. G.

Comparative electrochemical studies of highly purified lyophilic sols. III. Agar sol. W. PAULI and L. PALMRICH (Kolloid-Z., 1937, 79, 174—181; cf. this vol., 303).—Conductometric and potentiometric titrations, and measurements of the absorption of Ag from Ag_2O solutions and of the activity of Ag^+ in the resulting compound, have been carried out on a non-gelating agar fraction sol. in warm H_2O , after purification by electrodialysis and electrodecantation. The titration curves resemble those of strong monobasic acids, and the existence of a complex of 1 H_2SO_4 : 3 galactose units is indicated. The conductivity of fresh sols increases irreversibly with rise of temp. owing to partial hydrolysis of the sulphuric ester, but finally the increase becomes strictly reversible. Differences in the behaviour of agar and gum arabic sols are attributable to the greater strength of the ionising group in the former.

F. L. U.

Electrokinetic study of lyophilic properties of cellulose derivatives. Electrokinetic phenomena at the interface between sols of varying concentration of cellulose derivatives and (II) the dispersion medium, (III) solvent mixtures of varying composition. K. KANAMARU and T. KOHNO (Kolloid-Z., 1937, 79, 190—198, 198—208; cf. this vol., 305).—II. A measure of the interfacial charge density between sols of cellulose nitrate (N 11—13%) and acetate (Ac 53.4%) and the dis-

persion medium, $COMe_2$, has been obtained by observing the displacement of a thin stream of sol falling through the solvent in a transverse electric field. With increasing concn. of the nitrate, the initially positive charge decreases, and undergoes reversal of sign at a concn. c_0 , which, according to calculations from η measurements, corresponds with the complete disappearance of "free" solvent in the sol. Thereafter, the charge becomes more negative with concn. The acetate gives similar results, but with charges of opposite sign. The results are discussed theoretically.

III. The electrophoresis of a stream of cellulose nitrate in $COMe_2$ flowing into $COMe_2$ - $EtOH$ and $COMe_2$ - C_5H_8 mixtures, and of benzylcellulose in CH_2Ph - OH flowing into C_6H_6 - $EtOH$ mixtures, has been studied. If the concn. of the solute is $< c_0$, reversal of charge occurs at a definite composition of the outer liquid. If the concn. is $> c_0$, parallelism between the magnitude of the surface charge and the dissolving power of the mixture is observed. The results are interpreted on the basis of dipole orientation.

F. L. U.

Dependence of the viscosity of highly polymerised organic compounds on concentration. K. HESS and W. PHILIPPOFF (Ber., 1937, 70, [B], 639—665).—A review of recorded data and independent measurements lead to the conclusion that the relationship between viscosity and concn. of highly polymerised org. compounds from regions of low concn. through an extended range is best expressed by $\eta_{rel} = \{1 + ([\eta]/8c)\}^8$. With many different chemical systems differing widely in viscosity this relationship is so well fulfilled that it appears independent of the chemical nature of solute or solvent. With another group of systems the deviations are so great that this relationship cannot be regarded even as a rough approximation. The usual assumption that a mechanism independent of the chemical nature of the systems controls the relationship between viscosity and concn. of org. polymerides must be restricted to systems of the former class, whereas for those of the latter class greater complexity must be assumed. In addition to particle size and form, the mechanical properties of org. polymerides are influenced by solvation, but this is not the discriminating factor between the two classes. The behaviour of cellite in $AcOH$ suggests that the mol. size of materials of the second class varies with the concn. Although relationships appear more complex than previously assumed, viscosity is not thereby rendered less important for the characterisation of polymerides, but the val. $[\eta]^8$ should be used; this is designated the "characteristic viscosity const." Transition to mean mol. wt. (particle wt.) appears scarcely possible, since the necessary calibration by known methods (osmometry, ebullioscopy, cryoscopy) is uncertain, and extrapolation from one region of concn. to another is inadmissible if particle size varies with concn. and, also, it is not yet possible to give a theoretical interpretation of such a relationship. Comparison of the results obtained with suspensions of particles of defined length with those given by org. polymerides shows that the usual representations of the relation-

ship between particle form and viscosity are not sufficiently definitely established. The practical importance of the $[\eta]^8$ relationship lies in the possibility of determining η from very conc. or very viscous solutions and consequent comparison of the results in dil. solution with those obtained in technical practice. H. W.

Experiments with mixtures and influence of heterodispersivity on the flow curve of highly polymerised organic compounds. W. PHILIPPOFF (Ber., 1937, 70, [B], 827—838).—The viscosity of solutions of mixtures of cellulose trinitrate, collodion wool, and cellite can be expressed by $[\eta]_m = c[\eta]_1 + (1 - c)[\eta]_2$, which is based on $\frac{[\eta]_m}{[\eta]_1} = \{1 + ([\eta]_2/8c)\}^8$. This appears to apply generally to heterodisperse lyophilic colloids. The mixture rule gives further insight into the character and properties of highly polymerised org. compounds. H. W.

Change in ϵ -potential in the coagulation of arsenious sulphide and silver sols by electrolytes. E. V. FODIMAN and V. A. KARGIN (J. Phys. Chem. Russ., 1937, 9, 190—198).—The potentials of a Pt electrode coated with As_2S_3 and immersed in an As_2S_3 sol, and of a Ag electrode in a Ag sol, are changed by addition of salts to the electrolytes at the same concns. which are required to produce a change in ϵ -potential. It is assumed that the electrode surfaces have the same properties as the surfaces of the corresponding colloidal particles, and the conclusion is drawn that coagulation by salts is due not only to the change in ζ -potential, but also to a change in ϵ -potential. E. R.

"Zonal effect" in slow coagulation of colloidal arsenious sulphide. S. S. JOSHI and S. KULKARNI (Bull. Chem. Soc. Japan, 1937, 12, 145—147; cf. A., 1936, 1201).—During slow coagulation of As_2S_3 sols by H_2SO_4 , n diminishes in a series of steps. It is inferred that the coagulation process is itself discontinuous. F. L. U.

Coagulation of colloids. XVI. "Zonal effect" and anomalous variation of viscosity, transparency, and refractivity during coagulation of colloidal antimony sulphide by aqueous mercury chloride. S. S. JOSHI and T. M. MENON (J. Indian Chem. Soc., 1937, 14, 103—108; cf. A., 1936, 1200, 1337).—Discontinuous changes of n and viscosity are observed during slow coagulation, whilst the transparency remains almost stationary except in the initial stages. F. J. G.

Ageing of sols. Ageing of the system mercury acetamide-electrolyte in aqueous solution. E. M. PREIS (Kolloid. Shurn., 1937, 3, 23—34).— η and turbidity of Hg acetamide are increased by the addition of metallic nitrates; the formation of ppts. with $Ca(NO_3)_2$, $Pb(NO_3)_2$, etc. complicates the effect. Glycerol and gum arabic retard the ageing of the sols. Certain mixtures, e.g., with $Hg(NO_3)_2$, are thixotropic. J. J. B.

Light pressure and photophoresis in colloidal solutions. F. B. GRIBNAU, C. J. KROM, and H. R. KRUYT (Rec. trav. chim., 1937, 56, 565—572).—In experiments with Se and Au sols in which thermal radiation was, as far as possible, removed by filtration

from the illuminating beam, no movement of the particles due to illumination was observed. It is concluded that the photophoresis reported by Barkas (A., 1927, 17) was due to heating effects. F. L. U.

Penetration of colouring matters and colloidal particles through porous substances by imbibition. A. BOUTARIC (Ann. Soc. Sci. Bruxelles, 1937, 57, 39—52).—A summary of facts previously described (cf. A., 1936, 158, 793, 1196). The theory is developed quantitatively and the effects of adsorption and evaporation are considered. The results are applied to electro-capillary analysis. A. J. M.

(A) **Electrostriction in colloid-disperse systems.** V. I. NESTEROVA. (B) **Stabilisation and coagulation of diatomite suspensions.** V. I. NESTEROVA and N. N. PETIN. (C) **Nature of sorption processes in the system diatomite-aqueous electrolyte.** V. I. NESTEROVA, N. N. PETIN, and A. N. BOGOMOLOV (Sci. Rep. Moscow State Univ., 1936, No. 6, 99—104, 105—112, 113—125).—(A) The swelling of diatomite (I) or SiO_2 gel treated with aq. electrolytes [$Ca(OH)_2$, $CaCl_2$, $Ba(OH)_2$, $BaCl_2$, $LiCl$, KOH , KCl] runs parallel with the degree of hydration of the adsorbed cation and inversely as the solubility and degree of hydrolysis of the silicates formed.

(B) Suspensions of (I) are stabilised by $Ca(OH)_2$. Al , Fe^{II} , Fe^{III} , and $SO_3^{''}$ salts promote coagulation in absence of $Ca(OH)_2$ and inhibit swelling in its presence; no connexion between p_H and coagulative power is evident. The difference in stability of suspensions of washed and unwashed (I) is due to removal of adsorbed salts, and to difference in d of the particles resulting from removal of absorbed gases.

(C) Sorption of KOH , $Ca(OH)_2$, KCl , or $CaCl_2$ by (I) is a slow process, and involves the formation of silicates, followed by their hydrolysis. The process involves exchange of H^+ and Mg^{++} for K^+ and Ca^{++} in the diffusion layer of the gel. The adsorptive capacity of dry (I) is $<$ that of (I) previously soaked in H_2O . R. T.

Diffusion coefficients of inulin and other substances of interest in renal physiology. J. B. BUNIN, W. W. SMITH, and H. W. SMITH (J. Biol. Chem., 1937, 118, 667—677).—Recorded vals. ($cm.^2$, day) are: $CO(NH_2)_2$ 1.33, creatinine 0.85, sucrose 0.55, phenol-red 0.54 and carboxyhaemoglobin 0.086. Various inulin (I) preps. gave vals. 0.15—0.2. These would imply a mol. wt. of 15,000 on the assumption of a spherical molecule; accepting the val. 5100 as determined by colligative properties, they would imply an elongated mol. or (less likely) hydration. (I) must represent the approx. limit of normal glomerular filterability. Prolonged boiling with or without $NaCl$ does not alter the diffusion coeff. of (I), and must therefore be without effect on the average mol. wt. and form; i.e., any hydrolysis is compensated either by condensation or by opening rings to form more elongated chain mols. R. M. M. O.

Lyophilic colloids. X. Rotatory power and isoelectric point of gelatin fractions. S. M. LIEPATOV and V. A. GORBATOVA (Kolloid. Shurn., 1937, 3, 9—21; cf. A., 1936, 1202).— η and rotation

of aq. solutions of three gelatin fractions have been measured at varying p_H . The results are complicated and cannot be accounted for by existing theories.

J. J. B.

Luminous effect at the cathode in emulsions.

A. M. KRASILNIKOV (Sci. Rep. Moscow State Univ., 1936, No. 6, 177—179).—Cathode luminescence is observed in the electrolysis of emulsions of kerosene or petroleum in H_2SO_4 (5—10), $NaOH$ (5—15), $AlCl_3$ (2·5—5), $BaCl_2$ (5—10), and Na_2SO_4 (5—15%) solutions with C , Ni , Pb , Pt , Al , Hg , Cu , Fe , and Ag anodes and cathodes at 25—50° (c.d. 0·003—0·01 amp. per sq. cm.). The intensity of luminescence rises slowly to a max., and then falls. The phenomenon is ascribed to formation of micro-condenser systems, which are discharged at the cathode.

R. T.

Vapour-phase esterification equilibria.

S. K. K. JATKAR and N. G. GAJENDRAGAD (J. Amer. Chem. Soc., 1937, 59, 798—800).—Equilibrium between $EtOH$ and $AcOH$ vapours at 230° and 260°, using SiO_2 gel and K alum as catalysts, corresponds with 77% and 75% conversion of the equimol. mixtures.

E. S. H.

Equilibria of the reactions between acetylene and heavy water at 0° and 100° and the heats of reaction. L. H. REYERSON and B. GILLESPIE (J. Amer. Chem. Soc., 1937, 59, 900—902).—Equilibrium consts. for the reactions between H_2O , HDO , D_2O , C_2H_2 , C_2HD , and C_2D_2 have been determined and the heats of reaction calc.

E. S. H.

Hydrogen-deuterium exchange in acetate solution. S. LIOTTA and V. K. LA MER (J. Amer. Chem. Soc., 1937, 59, 946).—If any exchange occurs in D_2O - $NaOAc$ solutions, either slightly acid or alkaline, at room temp., it is exceedingly slow.

E. S. H.

X-Ray diffraction and electrolytic dissociation.

I. H. FALKENHAGEN (Naturwiss., 1937, 25, 189).—Priority over Krishnan (this vol., 302) is claimed for the investigation of the degree of electrolytic dissociation by X-ray diffraction.

A. J. M.

Kinetic determination of the dissociation constant of hypochlorous acid. A. SKRABAL and A. BERGER (Monatsh., 1937, 70, 168—192).—Possible reactions produced by the dissociation of $HOCl$ in solution are discussed. For a solution of $HOCl$ and $NaOCl$ the initial velocity of decomp. (v) can be expressed by $-d[OCl']/dt = k[HOCl]^2[OCl']$, in which $k = 1·57$ at 25°. For const. $[H']$, v is given by $-d([OCl'] + [HOCl])/dt = k\delta[H']^2([OCl'] + [HOCl])^3/([H'] + \delta)^3$, where δ is the dissociation const. of $HOCl$. The mean val. calc. for δ is $5·6 \times 10^{-8}$. Errors are introduced into the measurements through the accelerating influence of Cl' on the decomp.

J. W. S.

Physical chemistry of hydrofluoric acid.

W. A. ROTH, H. PAHLKE, A. BERTRAM, and E. BORGER (Z. Elektrochem., 1937, 43, 350—355).—Heats of dilution (H) of aq. HF have been measured at 20° over the range $n = 0·55 - 0·0007$ (n = mol. fraction of HF). Contrary to the usual assumption, H increases steadily with dilution, corresponding with the positive heat of dissociation of HF . $[H']][F']/$

$[HF]$ falls with increasing dilution to a const. val. 0·00055. Up to 0·125*N* the vals. of $[H']$ measured directly agree with those calc. from the transport nos., affording support for the reaction $HF + F' \rightarrow HF_2'$.

F. L. U.

Hydration of the ions in calcium nitrate.

F. BOURION and E. ROUYER (Compt. rend., 1937, 204, 1562—1564).—The hydration of ions in 0·25*M*- $Ca(NO_3)_2$ corresponds with $Ca(NO_3)_2 \cdot 21·3H_2O$. If all the H_2O is associated with the Ca^{+} ion, this result is in accord with the ionic hydration in $CaCl_2$ (see below).

J. W. S.

Individual hydration of ions.

F. BOURION, E. ROUYER, and (Mlle.) O. HUN (Compt. rend., 1937, 204, 1420—1422).—The individual vals. of the hydration of ions may be calc. from cryoscopic results (cf. A., 1935, 1459) by assuming that the NO_3' ion is unhydrated. The vals. obtained agree approx. with those of other workers, except for H' , for which the calc. hydration is 10 mols. in 0·5*N*- HCl .

R. S. B.

Activity coefficients of the nitrates of lead and barium as determined from water vapour pressure. A. P. RATNER (J. Phys. Chem. Russ., 1937, 9, 257—259).—Activity coeffs. are calc. from v.p. data at 70°, for 0·1—0·9*M*- $Ba(NO_3)_2$ and 0·1—2·0*M*- $Pb(NO_3)_2$. The vals. obtained are 0·402 to 0·189 for the former and 0·369 to 0·125 for the latter.

E. R.

Thermodynamic potential at constant volume in solutions of strong electrolytes. J. YVON (J. Phys. Radium, 1936, [vii], 7, 93—94).—Mathematical. The formula of Debye and Hückel for the mean distribution of ions in a solution in thermodynamic equilibrium is derived by means of the statistical theorem of Liouville.

O. D. S.

Thermodynamics of an activated complex.

E. A. GUGGENHEIM (Trans. Faraday Soc., 1937, 33, 607—614).—Thermodynamic relations of activated complexes are derived, special attention being given to the exact definition of standard states.

F. L. U.

Thermodynamics and velocity of irreversible processes. A. R. UBBELOHDE (Trans. Faraday Soc., 1937, 33, 599—606).—A method is described whereby information about the kinetic behaviour of a system not in equilibrium may be obtained without detailed analysis, from purely thermodynamic considerations. As examples, Ohm's law, the Wiedemann-Franz law, and equations for heat conduction, diffusion, and viscosity are derived.

F. L. U.

Calculation of physical constants of heterogeneous substances. III. Elastic constants of quasi-isotropic mixtures of isotropic substances. D. A. G. BRUGGEMAN (Ann. Physik, 1937, [v], 29, 160—178; cf. A., 1936, 151).—Elastic consts. are calc. for mixtures composed of alternating thin layers of isotropic substances or of small spheres embedded in an isotropic ground substance. For granular mixtures (granite type) the moduli lie between those of these two types, approximating more closely to the latter. Calc. vals. of the torsion no., compressibility, and tension no. of spherical porphyry indicate that at a certain composition the mixture

will have lower torsion no. than either of its components. Such a min. is observed for limestone concrete. O. D. S.

Theory of phase transitions. I. L. LANDAU (Physikal. Z. Sovietunion, 1937, 11, 26—47; cf. this vol., 22).—A thermodynamic treatment of the theory of continuous phase transitions, *i.e.*, transitions without latent heat. O. D. S.

Active oxides. CVII. Determination of activity of zinc oxide preparations by means of the Rinmann's green reaction. G. F. HUTTIG and H. SCHMEISER (Z. Elektrochem., 1937, 43, 356—357).—The temp. of formation of Rinmann's green from ZnO moistened with aq. $\text{Co}(\text{NO}_3)_2$ is mainly determined by the max. temp. to which the ZnO has been heated in the course of its prep., and is in general $40\text{--}100^\circ >$ the latter temp. F. L. U.

The systems $\text{TiNO}_2\text{--H}_2\text{O}$ and $\text{TiH}_2\text{PO}_2\text{--H}_2\text{O}$. A. FERRARI and C. COLLA (Gazzetta, 1937, 67, 88—94).—F.p.—composition diagrams are given. In the first system there is a eutectic at -7° with 1 mol.-% TiNO_2 . The m.p. of TiNO_2 is 182° . In the second there is a eutectic at -25° with 13.5 mol.-% TiH_2PO_2 . The m.p. of TiH_2PO_2 is 110° . O. J. W.

Ageing of fresh precipitates. XII. Equilibrium between mixed crystals of silver chloride and bromide and solutions. H. C. YUTZY and I. M. KOLTHOFF (J. Amer. Chem. Soc., 1937, 59, 916—921; cf. A., 1936, 561, 791).—The distribution coeff. (K) for Br' between mixed crystals of AgCl and AgBr and H_2O has been determined at 27° and 98° , and between AgBr and EtOH at 27° . At 27° K appears to be a linear function of the mol. fraction of AgBr in the solid. The mixed crystals cannot be considered as "regular solutions." At 98° K becomes practically independent of N_{AgBr} and the solid approaches the behaviour of an ideal solution. The val. of $K = \text{approx. the ratio of the solubility products of the components.}$ E. S. H.

Phase equilibria in systems containing sulphuric and hydrochloric acids. I. Tensimetric investigation of the system $\text{H}_2\text{O--HCl--H}_2\text{SO}_4$ G. P. LUTSCHINSKI and A. I. LICHATSCHIEVA (J. Phys. Chem. Russ., 1937, 9, 199—212).—The solubility of HCl in aq. H_2SO_4 is a linear function of the composition expressed in terms of $\text{H}_2\text{SO}_4\cdot 2\text{H}_2\text{O}$ and H_2O . The solubility in $\text{H}_2\text{SO}_4\cdot 2\text{H}_2\text{O}$ is 0.02 of that in H_2O . HCl can be removed from all mixtures by a current of air. Evidence has been obtained that $\text{HCl}\cdot 3\text{H}_2\text{O}$ can exist in equilibrium with $\text{H}_2\text{SO}_4\cdot 2\text{H}_2\text{O}$. E. R.

Ternary system $\text{K}_2\text{O--SO}_2\text{--H}_2\text{O}$. F. HOLZL (Z. Elektrochem., 1937, 43, 302—304).—Data are given for 0° , 11.5° , 25° , 33° , 40° , 65.3° , 80° , and 100° . F. L. U.

Ternary systems $\text{KClO}_3\text{--KBr--H}_2\text{O}$, $\text{KClO}_3\text{--KI--H}_2\text{O}$, and $\text{KIO}_3\text{--KI--H}_2\text{O}$ at 25° . J. E. RICCI (J. Amer. Chem. Soc., 1937, 59, 866—867).—Solubility data are recorded. No double compounds or solid solutions are formed; the only solid phases are the anhyd. salts. E. S. H.

Ternary systems $\text{NaNO}_3\text{--NaBr--H}_2\text{O}$ and $\text{NaNO}_3\text{--NaI--H}_2\text{O}$ at 25° . J. E. RICCI, J. BUDISH,

and N. BORODULIA (J. Amer. Chem. Soc., 1937, 59, 868—869).—Solubility data are recorded. The existing solid phases are NaNO_3 , $\text{NaBr}\cdot 2\text{H}_2\text{O}$, and $\text{NaI}\cdot 2\text{H}_2\text{O}$. E. S. H.

Heterogeneous equilibria in the ternary system lithium chloride-magnesium chloride-water. N. K. VOSKRESENSKAJA and O. K. JANATJEVA (Bull. Acad. Sci. U.R.S.S., 1937, 97—121).—The solid phases separating in the system, at -78° to 102° are $\text{LiCl}\cdot 1, 2, 3$, and $5\text{H}_2\text{O}$ (transition point of pentahydrate, -57°), $\text{MgCl}_2\cdot 6, 8$, and $12\text{H}_2\text{O}$, a double salt, $\text{LiCl}\cdot \text{MgCl}_2\cdot 7\text{H}_2\text{O}$, m.p. $93\text{--}95^\circ$ (decomp.), and a second double salt of undetermined composition. R. T.

Ternary systems of carbamide and acids. IV. Carbamide, citric acid, and water. V. Carbamide, acetic acid, and water. VI. Carbamide, tartaric acid, and water. L. A. DALMAN (J. Amer. Chem. Soc., 1937, 59, 775—779; cf. A., 1936, 491).—IV. Solubility measurements at 10° , 25° , and 40° show the existence of mono-, di-, and *tetra-carbamide citrate*; citric acid monohydrate exists only below $35\text{--}80^\circ$, and anhyd. citric acid above $33\text{--}73^\circ$.

V. The existence of $\text{CO}(\text{NH}_2)_2\cdot 2\text{AcOH}$ is confirmed; it exists only below 41.3° .

VI. Solubility data at 10° and 25° confirm the existence of dicarbamide tartrate and carbamide ditartrate. E. S. H.

Equilibria in the system $\text{NiSO}_4\text{--H}_2\text{SO}_4\text{--H}_2\text{O}$. A. V. BABAEVA and E. I. DANILUSCHKINA (Sci. Rep. Moscow State Univ., 1936, No. 6, 49—54).—The solid phases in systems containing $<68\%$ H_2SO_4 are $\text{NiSO}_4\cdot 2, 6$, and $7\text{H}_2\text{O}$, at $0\text{--}80^\circ$. In addition, the metastable hydrates $\text{NiSO}_4\cdot 4$ and $5\text{H}_2\text{O}$ are formed at 40° . R. T.

Fractionation of isomorphous double salts forming incongruent solutions. Quaternary systems $\text{KCl--RbCl--CsCl--MgCl}_2\text{--H}_2\text{O}$ at 25° . J. D'ANS and F. BUSCH (Z. anorg. Chem., 1937, 232, 337—368).—Various possible cases are discussed and it is shown that in systems of the above type fractionation can be accomplished by combining the process of crystallisation with that of decomp. of double salts with H_2O . Isotherms at 25° are given for the systems $\text{KCl--RbCl--H}_2\text{O}$ (complete series of mixed crystals); $\text{RbCl--MgCl}_2\text{--H}_2\text{O}$ and $\text{CsCl--MgCl}_2\text{--H}_2\text{O}$ (both carnallites form congruent solutions) and $\text{KCl--RbCl--MgCl}_2\text{--H}_2\text{O}$. F. J. G.

Equilibrium reactions of importance in chemical analysis. IV. Equilibrium constant of the reaction $\text{AgCl} + \text{CNS}' \rightarrow \text{AgCNS} + \text{Cl}'$. N. A. TANANAEV and N. V. SCHTSCHERBINA (J. Appl. Chem. Russ., 1937, 10, 545—548).—In equilibrium, at $12\text{--}16^\circ$, 99.43% of the Ag is present as AgCNS ; the results are unaffected by presence of HNO_3 . R. T.

Nitric acid treatment of phosphates. I. System $\text{CaO--P}_2\text{O}_5\text{--N}_2\text{O}_5\text{--H}_2\text{O}$, at 25° . A. P. BELOPOLSKI, M. N. SCHULGINA, M. T. SEREBRENNIKOVA, and S. J. SCHPUNT (J. Appl. Chem. Russ., 1937, 10, 403—413).—The solid phases at 25° are $\text{Ca}(\text{NO}_3)_2\cdot 0, 2, 3$, and $4\text{H}_2\text{O}$, CaHPO_4 (I), and $\text{Ca}(\text{H}_2\text{PO}_4)_2$ (II).

The solubility of (I) and (II) is greatly depressed by $\text{Ca}(\text{NO}_3)_2$. (II) is decomposed by HNO_3 of concn. $>69.8\%$, to yield H_3PO_4 and $\text{Ca}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$, and of concn. $<10.5\%$ to give (I) and H_3PO_4 ; intermediate concns. are without effect. $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ is stable towards H_3PO_4 of concn. $<36.1\%$ P_2O_5 , above which formation of (II) and HNO_3 takes place. R. T.

Double decomposition in the absence of a solvent. XXXIII. Mutual reversible system sodium and potassium nitrates and sulphates. A. G. BERGMAN and N. M. VAKSBERG (Bull. Acad. Sci. U.R.S.S., 1937, 71—95).—The equilibrium diagram for the system KNO_3 — NaNO_3 — K_2SO_4 — Na_2SO_4 has been derived. R. T.

Heat capacity of silver nitrite from 15° to 300° abs. Heat of dissolution at 298° abs. of silver nitrite, barium nitrate, and thallous nitrate. Entropy of silver nitrite, thallous ion, nitrate ion, and nitrite ion. O. L. I. BROWN, W. V. SMITH, and W. M. LATIMER (J. Amer. Chem. Soc., 1937, 59, 921—924).—Heat capacity data are recorded; the calc. entropy of AgNO_2 at 298.1° abs. is 30.62 e.u. Heats of dissolution of AgNO_3 ($10,070 \pm 100$ g.-cal.), $\text{Ba}(\text{NO}_3)_2$ (9496 g.-cal.), and TlNO_3 (10,020 g.-cal.) have been determined. The entropies are: NO_2' 29.0, NO_3' 35.0, Ti' 30.4 e.u. The free energy of formation of NO_3' at 298.1° abs. is $-26,310$ g.-cal. E. S. H.

Heat content of water sorbed on cellulose. J. H. SHIPLEY, W. B. CAMPBELL, and O. MAASS (Canad. J. Res., 1937, 15, B, 224—228).—The sp. heat of cellulose has been determined between -70° and 25° and the heat capacity of H_2O adsorbed by cellulose between -78.5° and 25° . W. R. A.

Heats of saturation and of hydration of sodium sulphate. J. PERREU (Compt. rend., 1937, 204, 1330—1332).—Data are recorded. H. J. E.

Affinity. LXXI. Heats of formation in the system Cu—Zn. F. WEIBKE (Z. anorg. Chem., 1937, 232, 289—296).—Heats of formation of alloys up to 63.1 at.-% Zn have been determined. For the α -phase saturated with Zn the val. 2.35 kg.-cal. per g.-atom is obtained, and by combining this with electrochemical measurements of Ölander (A., 1933, 771) heats of formation for the other phases are derived. F. J. G.

Heats of combustion of substances containing sulphur and halogens. W. A. ROTH (Z. Elektrochem., 1937, 43, 355—356).—Practical difficulties arising in the determination of heats of combustion of substances containing S and halogens, due chiefly to uncertainty regarding the nature and condition of the final products, are discussed. The use of a rotating bomb to ensure homogeneity is recommended. The heat of combustion of $(\cdot\text{CH}_2\cdot\text{CO}_2\text{H})_2$, burnt isothermally at const. vol., is 3025.5 g.-cal. per g. at 20° . F. L. U.

[Calorific] yields of the combustion of hydrocarbons, and energy values of the atomic linkings. M. BRUTZCUS (Compt. rend., 1937, 204, 859—861; cf. this vol., 223, 309).—The calculation of the calorific yields, and of the intrinsic vals. for the C—C and C—H linkings, is discussed. A. J. E. W.

Thermochemistry of boron. II. W. A. ROTH, E. BURGER, and A. BERTRAM (Ber., 1937, 70, [B], 971—973; cf. this vol., 186).—New data are recorded for the heats of dissolution, neutralisation, and dissociation of B_2O_3 , H_3BO_3 , and (approx.) of HBO_2 . The heats of formation of B_2O_3 and B_2H_6 are unchanged. H. W.

Heats of organic reactions. V. Heats of hydrogenation of various hydrocarbons. M. A. DOLLIVER, T. L. GRESHAM, G. B. KISTIAKOWSKY, and W. E. VAUGHAN (J. Amer. Chem. Soc., 1937, 59, 831—841; cf. A., 1936, 291).—Heats of hydrogenation have been determined for the reactions: $\text{PhEt} + 3\text{H}_2$, *o*-xylene + 3H_2 , mesitylene + 3H_2 , styrene + 4H_2 , hydrindene + 3H_2 , indene + 4H_2 , cyclopentene + H_2 , α -phellandrene + 2H_2 , α -terpinene + 2H_2 , limonene + 2H_2 , isopropylethylene + H_2 , neoamylethylene + H_2 , *tert*-butylethylene + H_2 , $\beta\delta\delta$ -trimethyl- Δ^a -pentene + H_2 , $\beta\delta\delta$ -trimethyl- Δ^b -pentene + H_2 , $\Delta^{a\gamma}$ -pentadiene + 2H_2 , $\beta\gamma$ -dimethyl- $\Delta^{a\gamma}$ -butadiene + 2H_2 . The results are discussed in relation to the rules previously formulated, and in terms of tetrahedral-angled models with which the facts are difficult to reconcile. E. S. H.

Electrolytic conductivities of aqueous solutions of rare-earth halides. G. JANTSCH, H. GRUBITSCH, and E. LISCHKA (Z. Elektrochem., 1937, 43, 293—296).—Data are recorded for SmCl_2 , EuI_3 , MX_3 ($\text{M} = \text{Y}, \text{Sm}, \text{Gd}, \text{X} = \text{Cl}, \text{Br}, \text{I}$), MCl_3 ($\text{M} = \text{La}, \text{Nd}, \text{Er}, \text{Yb}$), YbBr_3 , and ErI_3 at 0° and 25° , and EuCl_2 at 25° , for dilutions up to 2048 titres. The trihalides show only slight hydrolysis at the highest dilution. The stability of the dihalides in aq. solution is in the order $\text{Eu} > \text{Yb} > \text{Sm}$. F. L. U.

Electrolytic conductivity measurements applied to the thermodynamics of intermediate reactions. H. SCHMID, R. MARCHGRABER, and F. DUNKL (Z. Elektrochem., 1937, 43, 337—340; cf. A., 1936, 1069).—Apparatus for measuring the conductivity of a rapidly streaming liquid is described, and the method is applied to determine the dissociation const. (K) of HNO_2 . The following vals. are given: $K \times 10^4 = 3.5, 5.1, 7.1$ at $0^\circ, 25^\circ$, and 50° , respectively. F. L. U.

Behaviour of electrodes in solutions of foreign ions. I. L. ORESTOV (J. Phys. Chem. Russ., 1937, 9, 282—283).—When BaCl_2 is added to a solution of K_2SO_4 in the cell: Hg electrode—($\text{K}_2\text{SO}_4 + \text{BaCl}_2$)— KNO_3 (sat.)— KCl (sat.)—calomel electrode, the e.m.f. shows a max. when the quantity of BaCl_2 added is equiv. to that of K_2SO_4 . A corresponding min. is observed in titration of BaCl_2 by K_2SO_4 . The effect is probably due to adsorption of ions on Hg. E. R.

Behaviour of electrodes in solutions of foreign ions. I. L. ORESTOV (J. Phys. Chem. Russ., 1937, 9, 284—285).—The e.m.f. of the cell Pt (smooth)— $\text{K}_2\text{SO}_4 + \text{BaCl}_2$ —Hg shows a sudden increase when the BaCl_2 concn. becomes equiv. to that of K_2SO_4 , and a corresponding decrease in the reverse titration process. E. R.

Reduction potentials of trivalent [rare] earths. W. NODDACK and A. BRUKL (Angew. Chem., 1937, 50, 362—365).—Current-potential curves have been

determined for 0.01M solutions of sulphates of the rare-earth metals, using a dropping Hg cathode. All the curves show breaks due to the formation of bivalent ions and of amalgamated metal, the p.d. corresponding with the two stages being greatest with Eu, Yb, and Sm. Sc and Gd also show a relatively large p.d. between the reduction stages, suggesting the possibility of preparing bivalent salts of these metals.

F. L. U.

Polarographic studies with the dropping mercury cathode. LXVII. Equation of the polarographic wave in the electrodeposition of hydrogen from strong and weak acids. J. TOMEŠ (Coll. Czech. Chem. Comm., 1937, 9, 150—167).—The shape of the polarographic wave and the val. of the half-wave potential, have been determined for H₂ evolution in dil. solutions of AcOH, in absence and in presence of acetate, and of HCl. In HCl there is a linear relation between π_1 and log [HCl], and the wave is asymmetric. In AcOH in absence of acetate π_1 becomes more negative with increasing [AcOH], but in presence of excess of acetate the behaviour is similar to that observed in HCl solutions. The observed vals. of $\pi_1 - \pi_2$ for HCl and for AcOH in presence of excess of acetate are almost equal. The data have been compared with theoretical deductions from the over-potential relations of Frumkin (cf. A., 1933, 468) and of Herasymenko and Šlendyk (cf. A., 1930, 1125). Although the latter relation leads to conclusions more in agreement with the qual. nature of the data than the former, neither affords an explanation of the observations.

C. R. H.

Polarographic reduction potential of dinitro-compounds. J. EECKHOUT (Bull. Acad. roy. Belg., 1937, [v], 23, 295—307).—The reduction potential of 2 : 4-C₆H₃(NO₂)₂·OH has been measured at 25° at various p_H vals. with NH₄Cl as electrolyte. It becomes more negative as p_H increases and the potential-concn. curve is anomalous. The presence of foreign substances, including Zn²⁺, Ni²⁺, and LaCl₃, has a marked effect on the results obtained. Reduction potentials are also recorded for aq. solutions of 1 : 2 : 5- and 1 : 2 : 6-C₆H₃(NO₂)₂·OH, 1 : 4 : 6-C₆H₂Ph(NO₂)₂·OH, 2 : 4-dinitrocyclohexyl- and -cyclopentyl-phenol, 4 : 6- and 3 : 5-dinitroguaiacol, 3 : 5-dinitropyrocatechol, 4 : 6-dinitropyro-catechol Ph ether, Na 2 : 4-dinitrosalicylate, picramic acid, 2 : 4-dinitro- α -naphthol and its sulphonic acid.

S. C.

Decomposition potentials of fused electrolytes. I. P. TVERDOVSKI and V. S. MOLTSCHANOV (J. Phys. Chem. Russ. 1937, 9, 239—251).—The following decomp. potentials have been derived from current-p.d. curves: NaOH 2.32 volts (393°), 2.02 (543°); NaCl 3.06 (840°), 2.91 (945°); NaBr 2.88 (765°), 2.85 (800°); KCl 3.22 (800°), 3.00 (925°); KBr 3.00 (782°), 2.38 (842°); BaCl₂ 3.14 (1005°); 2.99 (1070°); MgCl₂ 2.55 (910°), 2.46 (800°); CaCl₂ 3.23 (852°), 2.90 (945°).

E. R.

Electromotive force of movement and of shock of metals in water and solutions and their relation to electrokinetic potential. S. PROCOPIU (J. Chim. phys., 1937, 34, 236—256; cf. A., 1936, C C (A, I.)

800).—Details are given of results previously recorded. Friction or shock on an electrode produces an e.m.f. which is quite different from the e.m.f. of movement, since it is caused by destruction of the surface layer of the solid.

J. W. S.

Time dependence of electrodic polarisation. I. Over-polarisation in the discharge of copper ions on a copper cathode. O. ESSIN, L. ANTROPOV, and A. LEVIN (J. Phys. Chem. Russ., 1937, 9, 269—275).—The "overpolarisation" ($\epsilon_m - \epsilon_c$) observed in the deposition of Cu rises to a max. ϵ_m after a certain time τ_m and then falls to a const. val. ϵ_c . ($\epsilon_m - \epsilon_c$) increases with c.d. and decreases with rise of temp. It increases at first with diminution of [Cu²⁺] but later becomes constant; it also decreases with increasing [Cu²⁺]. ϵ_c has a max. at a certain val. of c.d.

E. R.

Mechanism of action of halide ions in anode processes. T. S. FILIPOV (Ukrain. Chem. J., 1937, 12, 144—145).—Enhancement of anode oxidation by F⁻ in the electrolysis of H₂SO₄, NaOH, or Na₂SO₄ is ascribed in part to depolarisation of the anode, and in part to stabilisation of anions in the hydrosphere of the anode, leading to increased O overpotential. The process is explicable on the basis of the theory of primary decomp. of H₂O.

R. T.

Passivity of iron in chromic acid solutions. W. H. CONE and H. V. TARTAR (J. Amer. Chem. Soc., 1937, 59, 937—941).—Passive Fe in aq. HCrO₄ containing H₂SO₄ or other activating electrolytes becomes active when the pressure is reduced or when H₂ is admitted. The pressure of air or O₂ required to produce passivity increases rapidly with rise of temp. Oxide-coated wires can be made active by reduction of pressure. Passivity is ascribed to a layer of adsorbed O₂ at the Fe surface.

E. S. H.

Electrochemical investigation of sodium silicate hydrates. F. L. E. SHIBATA, T. TAKETA, and S. IMAI (J. Sci. Hiroshima Univ., 1937, 7, 183—189).—From e.m.f. data for the cell Na—Hg[Na₂SiO₃. n H₂O, H₂O sat., HgO|Hg at 10—60° the following appear to be the stable phases in contact with the saturated solutions at the temp. indicated: <6.8°, Na₂SiO₃.15H₂O; 6.8—12.3° Na₂SiO₃.14H₂O; 12.3—17.5° Na₂SiO₃.13H₂O; 17.5—21.6° Na₂SiO₃.12H₂O; 21.6—28.6° Na₂SiO₃.10.5H₂O; 28.6—41.7° Na₂SiO₃.10H₂O; 41.7—50.6° Na₂SiO₃.9H₂O; >50.6° Na₂SiO₃.6H₂O.

J. W. S.

Stoichiometry of simultaneous reactions. A. SKRABAL (Z. Elektrochem., 1937, 43, 309—318; cf. A., 1936, 684).—Theoretical. The kinetic behaviour of systems in which stable intermediate products are formed is deduced.

F. L. U.

Definition and determination of the two orders of a chemical reaction. M. LETORT (J. Chim. phys., 1937, 34, 206—216).—It is suggested that it is important to distinguish the order of a reaction as a function of time, and its order as a function of its initial velocity. The differential method of determination is preferred to integration methods, which apply only when the order is a whole no.

J. W. S.

Thermal formation of hydrogen chloride. G. KORNFELD and S. KHODSCHAN (Z. physikal.

Chem., 1937, B, 35, 403—426).—The rate of the dark reaction at $220^\circ \propto$ the Cl_2 pressure. O_2 has a retarding effect, but HCl has not. The reaction chains start on the wall by dissociation of Cl_2 mols. Most of the chains terminate on the wall owing to withdrawal of H and Cl atoms by the wall; almost every H atom striking the wall is held by it, but the accommodation coeff. of Cl atoms is only ~ 0.01 .

R. C.

Kinetics of oxidation of sulphur dioxide by oxides of nitrogen in sulphuric acid solution. E. K. LOPATTO and M. J. SCHAPIRO (J. Chem. Ind. Russ., 1937, 14, 266—276).—The velocity of oxidation of SO_2 by NO_2 in H_2SO_4 is greatest in 72% acid, and falls practically to zero in 98% H_2SO_4 ; the velocity of reaction is independent of the $[\text{HNO}_2]$ of the acid. NO evolved during the reaction originates from decomp. of an intermediate product, possibly $\text{H}_2\text{N}_2\text{O}_2$. The reaction is retarded by NO , which should be eliminated from the solution as rapidly as possible.

R. T.

Mechanism of thermal polymerisation and polycondensation. H. DOSTAL, H. MARK, and R. RAFF (Ind. Eng. Chem., 1937, 29, 595—599).—A review of previous theoretical, and of the authors' experimental, work.

R. C. M.

Kinetics of polymerisation reactions. H. DOSTAL and H. MARK (Angew. Chem., 1937, 50, 348—353; cf. A., 1936, 164, 295).—Previous work is summarised. Experiments on the thermal polymerisation of styrene, alone and in a solvent, show that the presence of O_2 gives rise to an, or lengthens an already existing, induction period, and diminishes the rate at which chain-growth is broken off.

F. L. U.

Thermal polymerisation reactions. J. W. BREITENBACH (Z. Elektrochem., 1937, 43, 323—324).—In the thermal polymerisation of vinyl acetate in glass vessels, the disturbing wall effect is eliminated if the substance is previously thoroughly dried (cf. A., 1936, 822). The velocity, however, decreases with time more rapidly than for a unimol. reaction. The same is true of the polymerisation of styrene dissolved in dioxan or decalin. An explanation is offered. The polymerisation of indene at 170° is strictly unimol.

F. L. U.

Thermal decomposition of ethane, ethylene, acetaldehyde, etc. M. W. TRAVERS (Trans. Faraday Soc., 1937, 33, 735—751).—The mechanism of pyrolysis of simple org. compounds is discussed on the basis of experimental data previously published (A., 1935, 40; this vol., 34), and a theory is advanced to explain the phenomena observed. It is assumed that the main reaction involves a simple bimol. process, modified by the operation of a "background reaction."

F. L. U.

Thermal decomposition of propane-propylene-hydrogen equilibrium mixtures. M. W. TRAVERS (Trans. Faraday Soc., 1937, 33, 751—755; cf. preceding abstract).—Detailed analytical data are recorded for the pyrolysis of C_3H_8 — C_3H_6 — H_2 equilibrium mixtures at 553° . The rate-determining process is the bimol. formation of a complex (C_3H_8 , C_3H_6), the subsequent decomp. of which yields CH_4 and C_2H_4

as primary, and C_2H_6 and condensate as secondary, products. In accordance with expectation, the ratio $(\text{C}_2\text{H}_6 + \text{C}_2\text{H}_4 + \text{condensate})/(\text{CH}_4)$ is approx. 2.

F. L. U.

Thermal decomposition of dimethyl ether. P. F. GAY and M. W. TRAVERS (Trans. Faraday Soc., 1937, 33, 756—770; cf. A., 1936, 1346).—Detailed analyses of the products formed during pyrolysis of Me_2O at 490° are recorded. The process is complex and cannot be satisfactorily followed by pressure measurements. The primary decomp. into CH_4 and CH_2O is strongly influenced by surface conditions and other factors not yet identified. The activation energy falls slightly with decrease in the initial concn. and reaches a lower limit of 38 kg.-cal. The effects of addition of H_2 , CH_4 , CO , and NO have been studied.

F. L. U.

Inflammation of gaseous mixtures. VIII. Two-stage mechanism of low-temperature self-inflammation of pentane. B. V. AIVAZOV and M. B. NEUMANN (J. Phys. Chem. Russ., 1937, 9, 231—238).—The self-inflammation of C_5H_{12} at 300 — 400° is a two-stage process. A cold flame (propagation velocity ~ 7 — 10 cm. per sec.) is formed after an induction period of a few sec. At $p > p_{\text{min}}$, it is followed, in < 1 sec., by a hot flame (velocity 500 — 1000 m. per sec.). For $\text{C}_5\text{H}_{12} + 4\text{O}_2$ at 318° , p_{min} is 330 mm. The two-stage mechanism is assumed to be responsible for the low-temp. self-inflammation of other hydrocarbons as well, and is applied to the explanation of combustion processes in Diesel motors.

E. R.

Anti-knocks and pro-knocks in the combustion of fuels. A. V. BELOV and M. B. NEUMANN (Nature, 1937, 139, 798—799).—Increases in pressure in C_5H_{12} —air mixtures of different concns., at a series of short time intervals after spark ignition, are tabulated. The initial rate of combustion passes through a max. when $[\text{C}_5\text{H}_{12}]$ is 110%. Curves showing the mean velocity as a function of $[\text{C}_5\text{H}_{12}]$, and the effect of adding PbEt_4 and isoamyl nitrite are reproduced. The results support the chemical theory of detonation in motors.

L. S. T.

Rate of oxidation of ethyl disulphide by bromine.—See A., II, 271.

Depolymerisation process in formaldehyde solutions. A. SKRABAL and R. LEUTNER (Österr. Chem.-Ztg., 1937, 40, 235—236).—The velocity of depolymerisation of conc. aq. CH_2O has been determined dilatometrically at 25° . The reaction is of the first order and the rate is at a min. at $p_{\text{H}} 3.45$.

E. S. H.

Effect of pressure up to 12,000 kg. per sq. cm. on the reactions between amines and alkyl halides in acetone solution. M. W. PERRIN and E. G. WILLIAMS (Proc. Roy. Soc., 1937, A, 159, 162—170).—Velocity coeffs. at various temp. and high pressures have been measured for the reactions of $\text{C}_5\text{H}_5\text{N}$ with MeI , Bu^tI , Pr^iI , and Bu^tBr , and also of Pr^iI with NMe_3 , NEt_3 , and NPhMe_2 . The parameters of the Arrhenius equation are calc. All the reactions are accelerated by increase of pressure.

G. D. P.

Rates of reaction of aliphatic acid halides.—See A., II, 272.

(A) **Kinetics of separation of vanadic acid from sodium vanadate solutions.** E. I. BUROVA. (B) **Kinetics of separation of salts from their supersaturated solutions.** N. N. PETIN (Sci. Rep. Moscow State Univ., 1936, No. 6, 15—41, 43—47).—(A) The velocity of pptn. of V_2O_5 from aq. $NaVO_3$ by $HCl \propto$ rate of stirring, temp., $[NaVO_3]$, $[HCl]$, and no. of centres of crystallisation present.

(B) Expressions representing velocity of pptn. of V_2O_5 are derived and verified. R. T.

Reduction of quinquivalent vanadium compounds by hydrochloric acid. E. F. KRAUZE and O. I. VOROBIEVA (Sci. Rep. Moscow State Univ., 1936, No. 6, 5—13).—The velocity of reduction of V^{V} to V^{IV} by $HCl \propto [HCl]$, $[NH_4VO_3]$, and temp. The reaction is: $V_2O_5 + 6HCl \rightarrow 2VOCl_3 + 3H_2O$; $2VOCl_3 \rightarrow 2VOCl_2 + Cl_2$. In pptg. V_2O_5 from vanadates by HCl the acidity should be $>5N$ at room temp., or $2.8N$ at 100° . R. T.

Hydrolysis of acid chlorides. II. Thionyl and sulphuryl chlorides. J. RODRÍGUEZ VELASCO and J. R. DE LA BORBOLLA. III. Benzoyl, *o*-methylbenzoyl, and phenylacetyl chlorides. J. RODRÍGUEZ VELASCO and A. OLLERO (Anal. fís. quím., 1936, 34, 905—910, 911—918).—II. The relation $-(K_2/K_1)^{1/2}$ (cf. this vol., 142) is confirmed for SO_2Cl_2 and $SOCl_2$ in $PhMe$, where K_1 , K_2 are the secondary dissociation consts. of the acids.

III. The above formula can be applied as an approximation to $BzCl$, *o*- $C_6H_4Me \cdot COCl$, and $CH_2Ph \cdot COCl$ in C_6H_6 if K_1 , K_2 represent the dissociation consts. of HCO_2H , $AcOH$, and HCO_2H , respectively, in accordance with the views of Zwecker (A., 1935, 1112). F. R. G.

Kinetics of bimolecular reactions in solutions.

I. V. A. GOLTZSCHMIDT and K. F. TRECHLETOV. II. V. A. GOLTZSCHMIDT and N. K. VOROBIEV (J. Gen. Chem. Russ., 1937, 7, 576—581, 582—590).—I. K , B , and E in Arrhenius' equation $K = Be^{-E/RT}$, for the reactions between $NPhMe_2$ or C_5H_5N and allyl (I) or benzyl bromide (II), in various solvents, are in all cases greater for C_5H_5N than for $NPhMe_2$, and for (II) than for (I). E and B for the reactions in $EtOH$ are $>$ in $COMe_2$, $COPhMe$, or $PhNO_2$, but K varies irregularly.

II. In the reactions between (I) and quinoline, m - and p -toluquinoline, $NPhMe_2$, m - or p - $C_6H_4Me \cdot NMe_2$, in various solvents, K diminishes in the series $COMe_2 < COPhMe < PhNO_2$, and $EtOH < MeOH < CH_2Ph \cdot OH$. In alcoholic solvents E and B are in all cases $>$ in other solvents. R. T.

Thermal polymerisation of styrene. W. JORDE (Monatsh., 1937, 70, 193—200).—The polymerisation of styrene in $PhMe$ solution has been followed both by change in n and by the distillation method as a function of time, temp., and concn. The nature of the reaction vessel has little effect on the polymerisation, but atm. O_2 accelerates the reaction. For lower styrene concns. viscosity measurements indicate an increase in chain-length during polymerisation. S

Velocity of dissociation of carbonates. K. G. CHOMIAKOV, S. F. JAVOROVSKAJA, and V. A. ARBUSOV (Sci. Rep. Moscow State Univ., 1936, No. 6, 77—87).—The velocity v of dissociation of $CaCO_3$ at 750 — 815° , or of $CdCO_3$ at 376 — 386° , in a stream of N_2 is given by $k(a-x)^{1/2}$. Three periods are distinguished in the process of calcination of carbonates, viz., an induction period, for which $v = k_1x^{1/2}$, terminated when the surface layer of the particles consists of oxides only, a period of max. velocity, for which $v = k_2(a-x)^{1/2}$, during which the partial CO_2 pressures at the surfaces and in the gaseous phase are identical, in view of the thinness of the oxide layer, and a terminal period, characterised by formation of thick layers of oxide, and for which $v = k(a-x)^{1/2}$. R. T.

Thermal decomposition of calcium azide. D. J. B. MARKE (Trans. Faraday Soc., 1937, 33, 770—776).—Andreev's results (A., 1935, 453) are confirmed. The activation energy for the decomp. between 80° and 100° is 18—19 kg.-cal., and for the formation of nuclei about 77 kg.-cal. The val. of n in $dp/dt = kp^n$ for ground CaN_6 is between 0.75 and 1.0, indicating that the nuclei formed are not so diffuse as those usually found in exothermic solid reactions. F. L. U.

Intermediate state in solid-phase reactions. G. F. HUTTIG (Chem.-Ztg., 1937, 61, 408—409).—A summary. An intermediate state, analogous to chain reactions in gas systems, is postulated. E. A. R.

Kinetics of reaction between oxygen and sulphur. II. Frigescient oxidation of sulphur. L. A. SAYCE (J.C.S., 1937, 744—748; cf. A., 1936, 163).—Mixtures of S and O_2 of widely different compositions react at about 160° when cooled rapidly from above 210° . The product is almost exclusively SO_2 , of which only negligible amounts are formed if the cooling is slow. Both condensed S and S vapour are oxidised. The latter reaction is accompanied by emission of light, and occurs only after the appearance of condensed S , the oxidation of which activates it. The condensed S reaction is initiated by energy released in a transition in the liquid. F. L. U.

Kinetics of wetting and linear corrosion of metals in polyphase systems: metal-liquid-liquid and metal-liquid-gas. II. D. I. MURLIS (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 549—552; cf. A., 1936, 1335).—The corrosion of Cu and Fe in H_2O and aq. electrolytes has been investigated by determining the variation with time of the angle of contact at the metal-liquid interface against a boundary of air or C_6H_6 . E. S. H.

Mechanism of the dissolution of metals, based on the adsorption theory. M. CENTNERSZWER and W. HELLER (J. Chim. phys., 1937, 34, 217—226).—A theory of the dissolution of metals is based on the adsorption of H^+ ions on active centres. The treatment is also applicable to other reactions in which the chemical processes are slow relatively to the rate of diffusion of the solvent. The theory explains the influence of impurities in the metal and in the solution and of colloids in the solution on the velocity of dissolution, passivity, overvoltage, and the induc-

tion period observed. The heat of activation of the reaction $\text{Sn}^{++++} + \text{Sn} \rightarrow 2\text{Sn}^{++}$ calc. from the Arrhenius equation is 10,929 g.-cal. per mol. J. W. S.

Mechanism of dissolution of polyoxymethylenes.—See A., II, 228.

Inhibition by nitric oxide of the decomposition of ethers. L. A. K. STAVELEY and C. N. HINSHELWOOD (Proc. Roy. Soc., 1937, A, 159, 192—205).—Small quantities of NO (1 or 2 mm.) reduce the rate of thermal decomp. of Me_2O , MeOEt , Et_2O , EtOPr^a , Pr^a_2O , and Pr^b_2O . The results are interpreted by assuming that NO breaks chains and that the limiting rate observed represents the rate of primary decomp. G. D. P.

Effect of metaphosphoric and other inorganic acids on the catalytic oxidation of ascorbic acid. C. M. LYMAN, M. O. SCHULTZE, and C. G. KING (J. Biol. Chem., 1937, 118, 757—764).—Catalytic oxidation of ascorbic acid (I) by Cu is inhibited (not in buffered solution at p_{H} 7) by addition of HPO_3 , which acts by decreasing $[\text{Cu}^{++}]$ and lowering p_{H} . The rate of oxidation depends primarily on the ratio $\text{HPO}_3 : \text{Cu}$. The rate of oxidation of (I) in various acid solutions containing a const. amount of Cu depends wholly on $[\text{H}^+]$ with H_2SO_4 and H_3PO_4 but is accelerated also by the anion with HCl and HBr. Atm. oxidation of (I) in presence of Cu results in H_2O_2 production and at $p_{\text{H}} > 4.5$ in evolution of CO_2 . W. McC.

Activation of ferrous salts by periodate. R. LANG and E. FAUDE (Z. anorg. Chem., 1937, 232, 271—283).—The induced oxidation of CH_2O , MeOH , HCO_2Na and H_3PO_3 by KIO_4 in presence of Fe^{II} salts has been studied. In alkaline media the max. induction ratio is 1, but much higher vals. are observed in acid media and these are linearly increased by added Fe^{III} salts. The primary process is $\text{IO}_4^- + \text{Fe}^{++} \rightarrow \text{IO}_3^- + \text{Fe}^{+++}$, followed by $2\text{Fe}^{+++} + (\text{e.g.}) \text{CH}_2\text{O} \rightarrow 2\text{Fe}^{++} + \text{HCO}_2\text{H}$, and a promoter action of Fe^{+++} , for which a mechanism is suggested, is superimposed on this. F. J. G.

Influence of solvent on chemical reactions. XIV. Aromatic hydrocarbons.—See A., II, 283.

Role of active acidity in the enzymic inversion of sucrose. S. M. KOBRIN (Sci. Rep. Moscow State Univ., 1936, No. 6, 181—198).—The velocity of decomp. of $\text{CHN}_2\text{CO}_2\text{Et}$ in solutions of $[\text{H}^+]$ $1.82\text{—}10.2 \times 10^{-4}$ is unaffected by presence of sucrose and invertase, showing that the process of enzymic inversion of sucrose does not involve variation in p_{H} . Conductivity measurements give analogous results. R. T.

Kinetic theory of invertase action.—See A., III, 269.

Energy of activation and temperature constants of enzymic reactions.—See A., III, 268.

Velocity of hydrolysis of some monoacid triglycerides under the influence of pancreatic extract. II.—See A., III, 268.

Use of adsorption isotherms for measuring surface areas of catalysts and other finely-divided materials.—See B., 1937, 541.

Oxidation catalysis. IV. Catalytic oxidation of dissolved substances at the surface of powdered contact materials. A. KUTZELNIGG (Angew. Chem., 1937, 50, 353—361; cf. A., 1936, 806).—Data published since 1867 are summarised in tabular form and references are given. F. L. U.

Effect of oxygen on the power of tungsten to dissociate hydrogen. G. BRYCE (Trans. Faraday Soc., 1937, 33, 782—784; cf. this vol., 85).—The inhibition of dissociation of H_2 by hot W caused by the presence of O_2 is due to a layer of oxide or oxides which is decomposed slowly at 1400° abs. in a vac. The decomp. proceeds similarly whether H_2 at low pressure is present or not. F. L. U.

Influence of deuterium oxide on the catalytic decomposition of hydrogen peroxide with colloidal solutions of platinum. E. OLIVERI-MANDALA and R. INDOVINA (Gazzetta, 1937, 67, 53—55).—The rate of decomp. of H_2O_2 by colloidal Pt is decreased in presence of D_2O . O. J. W.

Decrease in activity and change in lattice constant of poisoned catalysts. I. E. ADADUROV and N. M. GRIGOROVITSCH (J. Phys. Chem. Russ., 1937, 3, 276—283).—The poisoning of Pt and Cr_2O_3 catalysts by As_2O_3 causes an increase in the lattice const. a (e.g., from 3.918 to 3.935 Å. for Pt). The activity for oxidation of SO_2 decreases with an increase in a , but depends also on unknown factors. E. R.

Influence of the solid phase in the kinetics of slow oxidation of methane. M. V. POLJAKOV and A. V. KORNEEVA (J. Phys. Chem. Russ., 1937, 9, 260—268).—The velocity of oxidation of CH_4 has been measured at $700\text{—}850^\circ$ and $p_0 = 30$ mm., in an empty vessel and in presence of 1.5, 3, and 20 cm. of Pt wire. Up to 50—60% transformation it can be represented by $\Delta p - N e^{\psi t}$ (t —time), with $\psi = C e^{-48000/T}$ (T —temp.). Both N and ψ have a max. with 1.5 cm. of Pt; with 20 cm. of Pt ψ is $<$ in an empty vessel. This indicates that the influence of the Pt surface is composite; reaction chains must be both broken and initiated on the surface. E. R.

Reduction of iron catalysts for ammonia synthesis. I.—See B., 1937, 539.

Catalytic oxidation of hydrogen sulphide by active charcoal.—See B., 1937, 541.

Decomposition of hypochlorites in presence of activators. I, II.—See B., 1937, 540.

Properties of ruthenium, osmium, and iridium catalysts precipitated on highly active charcoal. P. P. BORISOV and S. S. STEPANOV (Sci. Rep. Moscow State Univ., 1936, No. 6, 347—352).—Ru Os, or Ir on C is a very active hydrogenation catalyst at $100\text{—}150^\circ$, and dehydrogenation catalyst at $200\text{—}300^\circ$. They cannot be used for aromatisation of cyclohexane derivatives, which undergo decomp. to CH_4 and H_2 in their presence. R. T.

Reactions caused by "activated" alumina. R. S. CAHN and R. F. PHIPERS (Nature, 1937, 139, 717—718).—Commercial activated aluminas contain relatively large amounts of adsorbed alkali and, in neutral solvents, bring about reactions normally

associated with alkaline reagents in hydroxylic solvents. Thus, diacetyltoxicarol in CHCl_3 is hydrolysed by passage through Al_2O_3 activated for chromatographic adsorption. This can be prevented by washing the Al_2O_3 with AcOH or PhOH in a neutral solvent, but the activity of the Al_2O_3 is largely destroyed. The alkalinity of activated Al_2O_3 may be responsible for abnormal results such as the isomerisation of carotene and the partial inactivation of vitamin-A and -K. L. S. T.

Variation in catalytic activity of ferromagnetic oxides at the Curie point. H. FORESTIER and R. LILLE (*Compt. rend.*, 1937, 204, 1254—1256).—The catalytic effect of ferrites of Mg, Cu, Ba, Sr, and Pb at 200—650° on the decomp. of AcOH to CO and H_2 , has been studied. Abrupt increases in catalytic efficiency occur in the neighbourhood of the Curie point. R. S. B.

Irradiated protein as oxidation catalyst of unsaturated acids.—See A., III, 253.

Promotion of metallic nickel layers by oxygen. K. ABLEZOVA and T. ZELINSKAJA (*J. Phys. Chem. Russ.*, 1937, 9, 252—256).—The velocity v of hydrogenation of C_2H_4 has been investigated on metallic Ni layers obtained by evaporation in an O_2 atm. and containing varying quantities of sorbed gas. $v = 0$ at $[\text{O}_2] = 0$ and increases to a sharp max. at $[\text{O}_2] = 8.3 \times 10^{15}$ mols. per Ni layer formed during 1 min. evaporation. The effect is attributed to a disturbance of the Ni lattice in the moment of its formation. E. R.

Catalysed polymerisation in monolayers of drying oils. G. GEE and E. K. RIDEAL (*J.C.S.*, 1937, 772—778; cf. A., 1936, 434).—A study of the polymerisation of maleic anhydride- β -elæostearin (I) spread as a monolayer on 0.01*N*- H_2SO_4 in presence of Co^{++} and of quinol, using the phase-boundary potential method, indicates that positive polymerisation catalysis does, and oxidation catalysis does not, involve the formation of a complex with the catalyst. When (I) is diluted with Et myristate, Me linoleate, Et linolenate, or Me β -elæostearate (of which only the last undergoes autoxidation at an appreciable rate), the oxidation rate is unchanged, but polymerisation is retarded. The inhibitory efficiency of the esters decreases with increasing unsaturation. The degree of polymerisation is usually < 5 . F. L. U.

Catalytic polymerisation of fatty oils.—See B., 1937, 586.

Wall effect in the decomposition of aqueous solutions of ferric chloride. J. GUÉRON (*Compt. rend.*, 1937, 204, 1195—1197; cf. this vol., 307).—The reaction is initiated by a film of Fe_2O_3 on the walls of the reaction vessel, this film being formed during the induction period. The rate of the subsequent reaction is decreased by the film. Once initiated, the reaction proceeds independently of the walls, and will continue in a clean vessel. A. J. E. W.

Effect of promoters on molybdenum catalysts as used in hydrogenation. F. E. T. KINGMAN (*Trans. Faraday Soc.*, 1937, 33, 784—793).—Under ordinary conditions of hydrogenation MoS_3 is con-

verted into MoS_2 and loses activity through decrease of surface due to crystallisation. Attempts to inhibit the coarsening by adding promoters showed that P, Si, Cu, Ni, and Cr enhance, whilst Sn and Th depress, the activity of the catalyst in reducing PhOH to C_6H_6 . NH_4 phosphomolybdate is a specially good promoter, and itself yields a highly active catalyst. Adsorption experiments with CO_2 show that high catalytic activity requires a high surface area. Sn and Th, however, depress the activity while increasing the area. X-Ray examination shows the MoO_2 structure in all the catalysts. The cryst. structure is well developed in all but the P-promoted catalyst, which remains microcryst. F. L. U.

Catalytic properties of rhenium. III. Preparation of rhenium catalysts. IV. Catalytic decomposition of formic acid and ethyl alcohol. M. S. PLATONOV and V. I. TOMILOV (*J. Gen. Chem. Russ.*, 1937, 7, 776—777, 778—781).—III. Re obtained by reduction of NH_4ReO_4 by H_2 at 400° powerfully catalyses dehydrogenation of alcohols to aldehydes.

IV. Decomp. of HCO_2H by Re at 100—250° proceeds exclusively according to $\text{HCO}_2\text{H} \rightarrow \text{CO}_2 + \text{H}_2$. Re acts exclusively as a dehydrogenation catalyst with EtOH at 300—500°. Re is activated by H_2S or As_2O_3 (> 0.001 mol. per mol. of EtOH). R. T.

Catalytic addition of hydrogen bromide and chloride to acetylene.—See B., 1937, 521.

Preparation of acetone from alcohol, using calcium carbonate and iron oxide as catalysts.—See B., 1937, 522.

Catalytic preparation of aliphatic aldehydes.—See B., 1937, 522.

Determinations of low concentrations of methane in gases.—See B., 1937, 575.

Black cathodic deposits. O. K. KUDRA (*J. Phys. Chem. Russ.*, 1937, 9, 286—291).—The time τ from the beginning of the electrolysis of aq. AgNO_3 to the appearance of a black deposit is measured and represented as a function of concn. (C) and c.d. (σ), by $\log C - 1.053 \log \sigma + 0.5564 \log \tau + 0.4247$. The formation of "blacks" is attributed to the discharge of complex ions (e.g., Ag_2NO_3^+). This is confirmed by a simultaneous jump in the decomp. potential of $\text{Cu}(\text{NO}_3)_2$ from 1.51 to 2.52 volts. E. R.

Zinc-plating of iron in acid electrolytes.—See B., 1937, 579.

Electrodeposition of platinum and gold.—See B., 1937, 579.

Electrolytic preparation of copper oxide and salts by the permeable diaphragm method. L. L. KLJATSCHKO-GURVITSCH (*Sci. Rep. Moscow State Univ.*, 1936, No. 6, 163—176).—A Cu anode is placed between two cathodes, separated from it by double parchment membranes, into which 10% Na_2SO_4 flows at a const. rate, when $\text{Cu}(\text{OH})_2$ is pptd. in the outflowing catholyte (optimum c.d. 0.015—0.02 amp. per sq. cm., $[\text{Cu}^{++}]$ of anolyte 0.5*N*, and $[\text{NaOH}]$ of catholyte 0.25—0.3*N*, at 50°). The analogous optimum conditions for a NaOAc electrolyte

are c.d. 0.01 amp. per sq. cm., $[\text{Cu}^{++}]$ 0.3N, $[\text{NaOAc}]$ 6–7%, at 45°. R. T.

Electrolytic separation of iodine from dilute solutions and mineral and petroleum waters.—See B., 1937, 542.

Chemical reaction in the electric discharge. II. Synthesis of nitric oxide. E. J. B. WILLEY (Proc. Roy. Soc., 1937, A, 159, 247–262).—Glow discharges in $\text{N}_2\text{--O}_2$ mixtures at 7 mm. pressure produce NO, no other oxide being formed. Impulse discharges are more efficient than either a.c. or d.c. discharges. The high-frequency electrodeless discharge is also very efficient. A theory of reaction in the electric discharge is advanced. G. D. P.

Oxidation of nitrogen in the high-frequency glow discharge.—See B., 1937, 541.

Photosynthesis of hydrogen chloride in oxygen-rich mixtures: quantum efficiency of water formation. M. RITCHIE (J.C.S., 1937, 857–865; A., 1935, 46).—In $\text{H}_2\text{--Cl}_2\text{--O}_2$ mixtures the quantum efficiency of HCl formation is reduced by addition of He, Ne, A, CO_2 , and N_2 . That of H_2O formation increases with increasing pressures of HCl, O_2 , CO_2 , and N_2 , and decreases with increasing pressure of Cl_2 . It is independent of the light energy absorbed. The mechanism is discussed. F. L. U.

Photoreaction of hydrogen iodide and methyl iodide. T. IREDALE and (Miss) D. STEPHAN (Trans. Faraday Soc., 1937, 33, 800–805; cf. A., 1936, 437).—The quantum yield for I_2 produced by illuminating HI–MeI vapour mixtures with a quartz Hg lamp is about 2 over a considerable range of composition. The results appear to rule out the photo-dissociation of MeI into $\text{CH}_3 + \text{HI}$, and are best explained by assuming $\text{MeI} \rightarrow \text{Me} + \text{I}$. F. L. U.

Mechanism of secondary processes in the photochemical decomposition of ammonia. W. MUND and A. VAN TIGGELEN (Bull. Soc. chim. Belg., 1937, 46, 104–128).—Reaction mechanisms are discussed with reference to existing data for the direct and Hg-sensitised photodecomp. and the radiochemical decomp. of NH_3 and N_2H_4 . The reaction $\text{NH}_2 + \text{H} + \text{M} = \text{NH}_3 + \text{M}$ may not play a large rôle in the photodecomp. of NH_3 and alternative mechanisms are suggested. J. G. A. G.

Photochemical investigations. III. Effect of cell size on the quantum yield for the decomposition of ammonia. E. O. WING (J. Amer. Chem. Soc., 1937, 59, 827–830; cf. A., 1935, 1331; 1936, 171).—The quantum efficiency for photolysis by λ 2100 Å. varies with the size of the reaction cell. The reaction is heterogeneous at NH_3 pressures < 300 mm. and may be partly heterogeneous at higher pressures. The mechanism is discussed. E. S. H.

Inhibition of photochemical reactions by nitric oxide. J. W. MITCHELL and C. N. HINSHELWOOD (Proc. Roy. Soc., 1937, A, 159, 32–45).—At 300° the quantum efficiencies of decomp. by light ($\lambda = 3135$ Å.) of MeCHO and EtCHO are greatly reduced by the presence of small amounts of NO. The behaviour

of CH_2O , COMe_2 , HCO_2Me , and MeOH has been investigated. G. D. P.

Energy of activation of actinic reactions accompanying the pyrolysis of azides. R. AUDUBERT (Compt. rend., 1937, 204, 1192–1194; cf. this vol., 164).— E is deduced from graphs of $\log F$ (F — intensity of emitted light) on $1/T$, which are straight lines. Results for Na, K, Pb, and Ag azides are given; two vals. of E for NaN_3 are obtained over different temp. ranges. The mechanism of the reactions is discussed. A. J. E. W.

Liberation of silver in photographic emulsions. J. J. TRILLAT and R. MERIGOUX (J. Phys. Radium, 1936, [vii], 7, 497–502).—Very thin emulsion films (50–100 m μ) were examined by electron diffraction, the electrons acting chemically in the liberation of Ag, and physically in the interference of electronic waves. The rapid appearance of cryst. Ag liberated by the electrons was followed by means of a fluorescent screen. Certain regions of the films gave only the AgBr pattern, the Ag pattern not appearing even after prolonged bombardment. Results are discussed in relation to the relative perfection of the cryst. lattice; the Ag appears to be most easily liberated for less perfectly formed lattices. Analogies with phosphorescence of ZnS, adsorption, and catalysis are examined. N. M. B.

Photochemical oxidation of carbon tetrabromide.—See A., II, 269.

Photochemical reactions in mono-layers. I. Photochemical properties of the keto-imino-linking. E. K. RIDEAL and J. S. MITCHELL (Proc. Roy. Soc., 1937, A, 159, 206–228).—Monolayers of stearanilide on strongly acid substrates undergo photochemical decomp. when irradiated by ultraviolet light of λ 2483 and 2350–2400 Å. The kinetics of such reactions are discussed. A quartz monochromatic illuminator is described. G. D. P.

Photochemical oxidation of organic substances by hydrogen peroxide in acid media with inorganic sols as photosensitisers. T. BANERJEE (J. Indian Chem. Soc., 1937, 14, 59–90).—The cases studied were (1) (a) glucose, (b) CH_2O , (c) fructose with tungstic acid sol, λ 366 m μ , (2) glucose with Cr^{III} tungstate sol, λ 366 m μ and 750–600 m μ , (3) glucose with vanadic acid sol λ 366 m μ , (4) glucose with $\text{Cr}(\text{OH})_3$ sol, λ 579 m μ , (5) EtOH with molybdic acid sol, λ 366 m μ . An induction period is observed in cases 1 (a), 2, 3, and 5, but can be removed by preliminary irradiation of the sol except in case 2. In case 1 (a) promoter action of certain Fe, Cu, or Mn salts was observed. With increasing $[\text{H}^+]$ the reaction rate in some cases decreases, and in others passes through a max. Temp. coeffs. are small (> 1.2 for 10°). After the induction period, observed quantum efficiencies and effects of varying light intensities and concns. of reactants are accounted for by mechanisms involving activation of adsorbed mols. of per-compounds. F. J. G.

Photochemical chlorination of *cis*-dichloroethylene to tetrachloroethane and of trichloroethylene to pentachloroethane. K. L. MULLER and H. J. SCHUMACHER (Z. physikal. Chem., 1937,

B, 35, 455—462).—The chlorination of *cis*-C₂H₂Cl₂ in light of λ 436 m μ proceeds similarly to the chlorination of *trans*-C₂H₂Cl₂ (this vol., 318) and with the same abs. velocity. O₂ retards strongly. Sensitised oxidation is scarcely perceptible even at 180°. Chlorination of C₂HCl₃ at 80° and 115° follows the equation $d[C_2HCl_3]/dt = kI^{1/2}[Cl_2]$ and only below 5 mm. does [C₂HCl₃] affect the rate. The temp. coeff. is 1.20, and the quantum yield for a Cl₂ pressure of 100 mm. and a light absorption of 1.7×10^{14} quanta per sec. is ~ 700 . O₂ inhibits chlorination and sensitised oxidation by a chain mechanism occurs.

R. C.

Photosynthesis and absorption of radiation by plants.—See A., III, 285.

Photochemical peroxide formation. VIII, IX. —See A., II, 270.

Action of α -particles on hydrogen sulphide largely diluted with hydrogen. W. MUND and A. VAN TIGGELEN (Bull. Soc. chim. Belg., 1937, 46, 129—140).—Each ion-pair produced by α -particles from Rn in 55—75 cm. of H₂ containing 6% of H₂S decomposes approx. 2 mols. of H₂S at 12°, consistent with part of the decomp. proceeding by way of H atoms derived from H₂. Negligible H₂S is formed by the action of α -particles on H₂ in a vessel of which the walls are covered with S.

J. G. A. G.

Ionisation theory and radio-biological reactions. C. E. NURNBERGER (Proc. Nat. Acad. Sci., 1937, 23, 189—193).—When a solution of tyrosine is irradiated by α -particles from Rn the val. of M_T/N (where M_T is the no. of tyrosine mols. altered by the rays and N is equal to the no. of ion-pairs produced in air by the same amount of irradiation) is approx. $\frac{1}{2}$ whereas for X-rays the corresponding figure is approx. $\frac{1}{3}$ and $\frac{1}{4}$. The difference may be due either to more rapid recombination of the ions produced by the α -particles or to direct mol. activation by the X-rays.

W. O. K.

Thermal precipitation of radioactive substances. F. A. PANETH and C. ROSENBLUM (Nature, 1937, 139, 796—797).—When a slow stream of air, carrying Rn in equilibrium with its active deposit, is passed through two parallel cover slips placed 0.1 mm. from a wire heated at 200°, most of the active deposit is pptd. on both glass surfaces opposite the wire, in the form of a narrow straight line.

L. S. T.

Superheavy oxygen, hydrogen, and water. E. C. FRITZMAN (J. Appl. Chem. Russ., 1937, 10, 578—588).—A lecture.

R. T.

Reactions in heavy water. H. SUESS (Österr. Chem.-Ztg., 1937, 40, 239—243).—Published work is reviewed.

E. S. H.

Do the different molecules of water in copper sulphate pentahydrate contain different proportions of deuterium oxide? H. PERPEROT and F. SCHACHERL (J. Chim. phys., 1937, 34, 257—264).—CuSO₄·5H₂O, recryst. from H₂O containing 0.478% of D₂O, yields H₂O of equal d from its first 4 mols. of H₂O of crystallisation and from its fifth mol.

J. W. S.

Anomalies in the action of water vapour. or ammonia on sodium or hæmatoxylin. P.

RENAUD and G. COSTEANU (Compt. rend., 1937, 204, 1258—1260).—Jets of H₂O vapour issuing from a capillary at 0.001—0.6 mm. did not attack Na at the point of emergence, but at a distance of 10 cm. Similarly jets of NH₃ vapour gave a homogeneous blue colour with a plate of hæmatoxylin + glycerol + H₂O, instead of the expected blue colour opposite to the point of emergence. Electrical connexion between a metal capillary and Na gave occasional attack at the point of emergence.

R. S. B.

Action of sulphur on silver. E. TOPORESCU (Compt. rend., 1937, 204, 1251).—The reaction between a crystal of S and a Ag mirror has been studied at room temp.

R. S. B.

Thermal decomposition of cuprammonium sulphates. E. RENCKER and P. VALLET (Compt. rend., 1937, 204, 1337—1339).—Data for the loss of NH₃ from CuSO₄·5NH₃ and CuSO₄·H₂O·4NH₃, obtained by the dilatometer method, and from the loss in wt. on heating at a steady rate, are recorded. The intermediate products CuSO₄·H₂O·2NH₃, CuSO₄·H₂O·NH₃, CuSO₄·2NH₃, and CuSO₄·NH₃ are formed in the decomp.

H. J. E.

Green basic copper carbonates. O. BINDER (Compt. rend., 1937, 204, 1200—1202).—Natural malachite is CO₂·2CuO·H₂O; the product obtained by pptn. from cold aq. solutions of Na₂CO₃ and CuSO₄ is CO₂·2CuO·1.5H₂O (I). The crystal lattices of the two are identical, the extra 0.5 mol. of H₂O in (I) being H₂O of hydration.

A. J. E. W.

Affinity. LXXII. Compounds of sodium and potassium with gold. U. VON QUADT, F. WEIBKE, and W. BILTZ (Z. anorg. Chem., 1937, 232, 297—306).—By heating Au with excess of alkali metal in an inert atm. and volatilising the alkali metal in a high vac., the following compounds, usually containing some excess of alkali metal in solid solution, have been obtained: Au₂Na, pale yellow; Au₂K, violet; Au₄K, olive-green. Au₂K and Au₄K have no definite metallic lustre and appear to be semi-metallic compounds. All three are fairly stable to air. d and X-ray diagrams of various preps. are given.

F. J. G.

Affinity. LXXIII. Combining power of rubidium and gold. H. J. EHRHORN, F. WEIBKE, and W. BILTZ (Z. anorg. Chem., 1937, 232, 307—312).—The compound Au₂Rb is dark green and fairly stable to air. In its prep. (cf. preceding abstract) a black powder of variable composition is at first obtained; this is neither a definite compound nor a simple mixture. It is regarded as a mixed phase in an intermediate state, or an adsorption complex. d and X-ray diagrams of various preps. are given.

F. J. G.

Action of soda in solution on hydrated tetra-calcium aluminate. (MLLE.) J. FORET (Compt. rend., 1937, 204, 1335—1337).—Data are recorded for the Al₂O₃ dissolved from hydrated Ca₄ aluminate by aq. NaOH of varying concn. For concns. up to 0.005N the effects of NaOH and Ca(OH)₂ are identical. For concns. > 0.04N the dissolution of Al₂O₃ by aq. NaOH increases rapidly with concn.

H. J. E.

Chemistry of hydration of calcium aluminates and cements. G. ASSARSON (Zement, 1937, 26,

293—298, 311—315, 327—330).—A review of recent work (cf. this vol., 194). G. H. C.

Calcium silicophosphate. G. NAGELSCHMIDT (J.C.S., 1937, 865—867).—A compound $7\text{CaO} \cdot 2\text{SiO}_2 \cdot \text{P}_2\text{O}_5$ has been isolated from basic slag. Analyses are given. X-Ray powder diagrams show that the compound is not a mixed crystal of silico-carnotite and Ca_2 silicate. F. L. U.

Reactions between solids and solutions. I. Calcium phosphate and sodium carbonate. K. A. KOBE and T. F. DOUMANI (Z. anorg. Chem., 1937, 232, 319—324).—The effect of conditions on the reaction between aq. Na_2CO_3 and (a) pptd. $\text{Ca}_3(\text{PO}_4)_2$ and (b) bone ash has been studied. A specimen of rock-phosphate gave no reaction up to 200° . The reaction stops when a small % of phosphate has been decomposed, but can be made to continue slowly by continuous grinding. The % decomp. increases with $[\text{Na}_2\text{CO}_3]$ and is much decreased by previous ignition. Temp. has little influence with $\text{Ca}_3(\text{PO}_4)_2$ but with bone ash there is a sharp max. at about 70° . F. J. G.

Chemical and X-ray investigation of barium sulphate contaminated with permanganic acid. P. R. AVERELL and G. H. WALDEN, jun. (J. Amer. Chem. Soc., 1937, 59, 906—911).—Procedure for pptg. rose-coloured BaSO_4 , contaminated with equiv. quantities of H^+ and MnO_4^- and a variable amount of H_2O , is described. When the lattice parameters of the ppts. are plotted against the wt.-% of total contaminant present, a smooth, rising curve is obtained; the ppts. are solid solutions. In BaSO_4 contaminated with NO_3^- , the mol. ratio $\text{Ba} : \text{SO}_4$ is >1 . The main factors controlling the formation of solid solutions in ppts. are the size, charge, and configuration of the ions entering the lattice. E. S. H.

Action of zinc oxide on kaolin at different temperatures.—See B., 1937, 548.

[Mercury silver manganese oxalate.] N. A. TANANAEV (J. Appl. Chem. Russ., 1937, 10, 542—544).—A ppt. of composition $\text{Hg}_2\text{Ag}_2[\text{Mn}(\text{C}_2\text{O}_4)_3]$ (I) is obtained when a solution of HgNO_3 , AgNO_3 , and $\text{Mn}(\text{NO}_3)_2$ in dil. HNO_3 is added to hot conc. aq. $\text{H}_2\text{C}_2\text{O}_4$. (I) is decomposed by aq. NH_3 , NaOH , or KI to yield Hg-Ag , MnO_3 , and C_2O_4 . R. T.

Boron hydrides. VII. Evidence of the transitory existence of borine (BH_3): borine carbonyl and borine trimethylamine. A. B. BURG and H. I. SCHLESINGER (J. Amer. Chem. Soc., 1937, 59, 780—787; cf. A., 1936, 712).—The prep. of BH_3CO and of $\text{NMe}_2 \cdot \text{BH}_3$ is described. The b.p. of BH_3CO calc. from v.p. determinations is -64° , heat of vaporisation 4750 g.-cal. per mol., Trouton const. 23.0 g.-cal. per mol. BH_3CO decomposes easily into B_2H_6 and CO ; the variation in the rate of decomp. suggests that free mols. of BH_3 may be involved in the process. $\text{NMe}_2 \cdot \text{BH}_3$ has m.p. $94-94.5^\circ$; v.p. determinations yield by calculation b.p. 171° , heat of vaporisation 10,064 g.-cal. per mol., heat of fusion 327 g.-cal. per mol., Trouton const. 22.7. E. S. H.

Light from burning Al-Zn and Al-Cd alloys. J. A. M. VAN LIEMPT and J. A. DE VRIEND (Rec. trav. chim., 1937, 56, 594—598; cf. A., 1935, 459).—

Addition of Zn or Cd to Al used for flashlight photography increases the combustibility, the light yield, and the rate of combustion. The colour of the light is substantially unchanged. F. L. U.

Rare earths. G. JANTSCH (Österr. Chem.-Ztg., 1937, 40, 218—225).—A lecture. E. S. H.

Attempt to prepare silicon dichloride. R. SCHWARZ and G. PIETSCH (Z. anorg. Chem., 1937, 232, 249—256).— SiCl_4 and H_2 in the glow discharge give small amounts of a white solid, usually mixed with much polysilene, which is probably SiCl_2 . Evaporation of a solution in MeOH deposits it together with a non-volatile liquid from which it could not be separated. This appears to be $[\text{Si}(\text{OMe})_2]_x$. F. J. G.

Silicon chloride of formula $\text{Si}_{10}\text{Cl}_{22}$. R. SCHWARZ and H. MECKBACH (Z. anorg. Chem. 1937, 232, 241—248).—The compound is formed as a viscous oil together with more volatile products by passing SiCl_4 in a stream of H_2 or A over a glowing carborundum fibre. Analyses and mol. wt. in C_6H_6 correspond with $\text{Si}_{10}\text{Cl}_{22}$. H_2O in Et_2O gives the compound, $\text{Si}_{10}(\text{OH})_{22}$ as a white powder. Both are inflammable. F. J. G.

Chlorosulphonate chlorides. II. Tin and antimony chlorosulphonate chlorides. A. I. LICHATSCHIEVA (J. Gen. Chem. Russ., 1937, 7, 959—961).— SnCl_4 and SO_3 in SO_2Cl_2 yield $\text{SnCl}_2(\text{SO}_3\text{Cl})_2$, and SbCl_5 and SO_3 give $\text{SbCl}_4 \cdot \text{SO}_3\text{Cl}$ and $\text{SbCl}_3(\text{SO}_3\text{Cl})_2$. The salts react with H_2O to give H_2SO_4 , HCl , and $\text{Sn}(\text{OH})_4$ or H_3SbO_4 . R. T.

Oxidation of leuco-methylene blue by nitrates and nitrites.—See A., II, 309.

Specific formation of solid hydrogen phosphide. I. MATHIESEN and F. W. WRIGGE (Z. anorg. Chem., 1937, 232, 284—288).—Solid hydrogen phosphide, somewhat contaminated by metallic phosphides, is obtained in good yield when Co-Sn-P alloys are treated with conc. HCl . F. J. G.

Action of ammonia on phosphorus trichloride. Phosphorus pernitride P_4N_6 and paranitride $(\text{PN})_n$. H. MOUREU and G. WETROFF (Bull. Soc. chim., 1937, [v], 4, 918—932; cf. A., 1936, 440, 1476).—Contrary to the statements of previous authors, NH_3 is not primarily produced in the decomp. by heat of $\text{P}_2(\text{NH})_3$, which takes place thus: $2\text{P}_2(\text{NH})_3 = \text{P}_4\text{N}_6 + 3\text{H}_2$. P_4N_6 is stable up to 750° , above which it loses N_2 and forms $(\text{PN})_n$. Details of experiments and analyses are given. F. L. U.

New inorganic phosphorus compound in yeast.—See A., III, 271.

Reaction between potassium iodide and bis-muth tri-iodide in acetone solution. A. CHRÉTIEN and E. EICH (Bull. Soc. chim., 1937, [v], 4, 1102—1115).—The colours of various dil. mixtures of the two salts in COMe_2 have been compared in a Duboscq colorimeter. A graphical method based on composition-colour intensity diagrams is described; it is deduced that only one complex, viz., $\text{KI} \cdot \text{BiI}_3$, exists in solution. Its dissociation const. at 20° is calc. to be $\sim 2 \times 10^{-6}$. C. R. H.

Evaluation of activity of metals in melts from the equilibrium coefficient. J. I. GERASIMOV

(Sci. Rep. Moscow State Univ., 1936, No. 6, 55—60).—The product obtained by heating excess of Bi with S at 510° is shown, on theoretical grounds, to contain BiS. A method whereby the activity of a metal dissolved in its fused salt is evaluated from the equilibrium coeff. is described. R. T.

Action of ammonia on tantalum pentachloride. P. SPACU (Z. anorg. Chem., 1937, 232, 225—228).—Previous work (A., 1935, 1090) is criticised. Isotherms at -81.5° , -67.5° , and -44° show the existence of a dodeca-, deca-, and hepta-ammoniate, respectively. The last is stable up to 0° , when ammonolysis occurs to $Ta(NH_2)_2Cl_3 \cdot 3NH_3$. At 78° decomp. begins and NH_4Cl sublimes at 184° . F. J. G.

Separation of oxygen isotopes by a fractionating column. J. R. HUFFMAN and H. C. UREY (Ind. Eng. Chem., 1937, 29, 531—535).—In order to take advantage of the slight differences in the v.p. of ^{16}O and ^{18}O waters to effect a concn. of the heavy isotope a special experimental fractionating column was constructed. It consisted of seven 5-ft. lengths of 6 in. diameter pipe, each fitted with 87 fixed and 87 rotating conical plates spaced $\frac{5}{8}$ in. apart; these sections could be locked together to form a single column which was provided with the necessary auxiliaries. The work showed that such a plant could be expected to permit a concn. of 2.5% $H_2^{18}O$ to be reached after 50 days' steady running, after which 20 c.c. per day of such concn. should be produced. F. J. B.

Chemistry in liquid sulphur dioxide. IV. Thionyl diammonium compounds. (Coloured amidosulphinic acid derivatives.) G. JANDER, H. KNOLL, and H. IMMIG (Z. anorg. Chem., 1937, 232, 229—237).—The yellow additive compound $SO_2 \cdot NH_3$ is to be regarded as thionyldiammonium sulphite, $[(NH_3)_2SO]SO_3$, and not as amidosulphinic acid. With liquid SO_2 it behaves as a sparingly sol. "base" undergoing neutralisation reactions with "acids" like $SOCl_2$, to form thionyldiammonium salts: $[(NH_3)_2SO]Cl_2$, $[(NH_3)_2SO]SO_4$, and $[(NH_3)_2SO]I_2 \cdot 2SO_2$. The orange compound $SO_2 \cdot 2NH_3$ is regarded as thionyldiammonium oxide, $[(NH_3)_2SO]O$. F. J. G.

Behaviour of chromic oxide to alkali halogenate solutions. III. Reaction system chromic oxide-chlorate and the influence of sparingly soluble carbonates as reaction components in the systems chromic oxide-chlorate and chromic oxide-bromate. R. LYDÉN (Z. anorg. Chem., 1937, 232, 325—336; cf. A., 1935, 834; 1936, 167).— Cr_2O_3 dissolves in hot alkali chlorate or bromate solution forming chromate, halide, and free halogen. In presence of alkali hydroxide or carbonate, or of phosphate buffers, the reaction is completely inhibited. In presence of sparingly sol. carbonates (Ca, La, Be), or with bromate and $KHCO_3$ in a sealed tube, it proceeds slowly but without forming free halogen, the ratio of Cr_2O_3 oxidised to halogenate reduced being 1:1. The primary process is $Cr_2O_3 + MXO_3 + aq. \rightarrow 2CrO_3 \cdot aq. + MX$ ($M = Na$ or K ; $X = Cl$ or Br) whilst in absence of neutralisers the acid formed liberates halogen thus: $5X' + XO_3' + 6H' \rightarrow 3H_2O + 3X_2$. F. J. G.

Constitution of the erythro- and rhodochromic salts. K. A. JENSEN (Z. anorg. Chem., 1937, 232, 257—266).—New constitutions suggested are: rhodo-salts $[(NH_3)_5Cr \cdot OH \cdots Cr(NH_3)_5]X_5$; basic rhodo-salts $[(NH_3)_5Cr \cdot O \cdots Cr(NH_3)_5]X_4$; erythro-salts $[(NH_3)_5Cr \cdot NH_2 \cdots Cr(NH_3)_4(H_2O)]X_5$ and basic erythro-salts $[(NH_3)_5Cr \cdot NH_2 \cdots Cr(NH_3)_4(OH)]X_4$. The two isomerides of each pair give the same X-ray diagram. Normal and basic erythro-chloride and basic rhodochloride are described. F. J. G.

Molybdenum blues. Phosphoceruleomolybdic acid. V. AUGER and (MLLE.) N. IVANOFF (Compt. rend., 1937, 204, 1424—1426).—A Mo-blue of the composition $H_3PO_4 \cdot (Mo_6O_{19})_n \cdot nH_2O$, where n is variable and is approx. 19, has been prepared by the addition of H_3PO_4 to a 2:1 solution of Mo^{VI} and Mo^V in the form of chlorides. R. S. B.

Uranyl salts. E. MONTIGNIE (Bull. Soc. chim., 1937, [v], 4, 1142—1144).—The prep. of $(UO_2)_2I_2O_9 \cdot 5H_2O$ and UO_2HPO_3 by double decomp. of $UO_2(NO_3)_2$ and KIO_4 or Na_2HPO_3 is recorded. No molybdate of definite composition and no chlorate could be obtained on account of hydrolysis. In the former case two consecutive reactions are suggested in explanation of the formation of molybdates of indefinite composition, viz., $(n+1)MoO_3 + UO_2(NO_3)_2 + H_2O \xrightarrow{2HNO_3} UO_2MoO_4 \cdot nMoO_3$ and $UO_2MoO_4 \cdot nMoO_3 + (n+2)H_2O \rightleftharpoons (n+1)H_2MoO_4 + UO_2(OH)_2$. C. R. H.

Purification of chlorates. F. TARADOIRE (Bull. Soc. chim., 1937, [v], 4, 1152—1155).—Several methods of purifying $KClO_3$ and $Ba(ClO_3)_2$ are described. C. R. H.

Pyrolysis of chlorates and perchlorates. II. M. CRESPI and J. L. G. CAAMANO (Anal. fis. quim., 1936, 34, 901—905).—The depression of the initial decomp. temp. of $NaClO_3$ by SiO_2 and MnO_2 is greatest for equimol. mixtures and is compared with data for $KClO_3$ and $KClO_4$ (cf. A., 1936, 803). F. R. G.

Preparation of constant-boiling hydrobromic acid. G. B. HEISIG and E. AMDUR (J. Chem. Educ., 1937, 14, 187—188).—The prep. of this acid in 85% yield from KBr and H_2SO_4 is described. Druce's procedure (A., 1923, ii, 65) gave distillates which contained H_2S or S and often SnS_2 . L. S. T.

Photographic recording of the reduction of iron oxides in presence of their natural impurities. F. OLMER (Compt. rend., 1937, 204, 1197—1200).—The technique is described, and curves showing the degree of reduction by H_2 at increasing temp. $>1000^\circ$ are given for Fe_2O_3 , Fe_3O_4 , and mixtures of Fe_2O_3 with $CaCO_3$, P_2O_5 , SiO_2 , and Al_2O_3 . The existence of $Fe_2O_3 \cdot 2CaO$ and $FeO \cdot Al_2O_3$ is deduced. A. J. E. W.

Alkali salts of hydrocobalticyanic acid. J. MEYER and P. CHAO (Z. anorg. Chem., 1937, 232, 238—240).—Double decomp. between alkali chloride and $Ag_3Co(CN)_6$ gives salts $Li_3Co(CN)_6 \cdot 6H_2O$, $Rb_3Co(CN)_6$, and $Cs_3Co(CN)_6$. F. J. G.

Course of complex reactions in analogous systems. F. HOLZL (Z. Elektrochem., 1937, 43, 319—322; cf. A., 1934, 876).—The reactions between

$\text{H}_3\text{Co}(\text{CN})_6$ and H_2O and MeOH , and between $\text{H}_4\text{Fe}(\text{CN})_6$ and H_2O , MeOH , and EtOH have been compared, the action in each case being followed by potentiometric titration with NaOH . There is considerable variation in the intermediate reactions of these apparently analogous systems, leading in some cases to differences in the end products. F. L. U.

Oxidation of non-electrolytic cis-bivalent platinum compounds with sulphuric acid. A. V. BABAEVA (Bull. Acad. Sci. U.R.S.S., 1937, 25—32).— $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ and conc. H_2SO_4 yield $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2(\text{OH})]$, converted by heating into $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2(\text{OH})_2]$. $[\text{Pt}(\text{NH}_3)_4(\text{NO}_2)_2]$ or $[\text{Pt en}(\text{NO}_2)_2]$ and H_2SO_4 afford $[\text{Pt}(\text{NH}_3)_2(\text{NO}_2)_2(\text{OH})]$ or $[\text{Pt en}(\text{NO}_2)_2(\text{OH})]$. $[\text{Pt}(\text{C}_5\text{H}_5\text{N})_2\text{Cl}_2]$ or $[\text{Pt}(\text{C}_5\text{H}_5\text{N})_2(\text{NO}_2)_2]$ is not oxidised by H_2SO_4 . R. T.

Ethylene compounds of platinum.—See A., II, 282.

Quantitative analysis by emission spectra. K. CRUSE (Angew. Chem., 1937, 50, 397—400).—Sources of error arising from the nature and structure of alloys, from conditions of excitation, and from the characteristics of the photographic material are discussed. J. S. A.

Quantitative analysis of metallic solutions with the spectrograph. P. JOLIBOIS and R. BOSSUET (Compt. rend., 1937, 204, 1189—1190).—Apparatus for obtaining a spark between a Pt electrode and the surface of the solution, under const. conditions suitable for quant. measurements, is described. A. J. E. W.

Chemical analysis by X-ray diffraction methods. W. P. DAVEY (Amer. Soc. Test. Mat., Symp. on Radiography, 1936, 284—301).—A review. R. B. C.

X-Ray determination of particle size. C. H. CAMERON and A. L. PATTERSON (Amer. Soc. Test. Mat., Symp. on Radiography, 1936, 324—326).—A comprehensive review. R. B. C.

Dispersoid analysis with photo-electric cell. E. HOFFMANN (Kolloid-Z., 1937, 79, 154—155).—An expression is deduced whereby the size distribution of particles in a sedimenting suspension may be calc. from the intensity-time curve obtained when parallel light is passed through a layer at an intermediate height in a vertical column of the suspension. F. L. U.

Theory of titration. I. Evaluation of error in the saturation method. N. A. TANANAIEV (J. Appl. Chem. Russ., 1937, 10, 528—541).—Mathematical. R. T.

Systematic analysis of anions. T. P. CHAO (J. Chinese Chem. Soc., 1937, 5, 60—85; cf. this vol., 96).—Full details of the procedure are given. J. G. A. G.

Mechanism of process of substitution of metals. A. P. SERGEEV (J. Appl. Chem. Russ., 1937, 10, 557—561).—Characteristic dendritic formations obtained when one metal is displaced from solution by another may serve for its detection. R. T.

Use of adsorption indicators in acidimetry and alkalimetry. S. N. ROY (J. Indian Chem. Soc., 1937, 14, 120—121; cf. A., 1936, 1351).—

Fluorescein or eosin in presence of traces of SnCl_2 can be used as indicator in titrating strong acids in fairly conc. solution. F. J. G.

Borax as an acidimetric standard. II. F. H. HURLEY, jun. (Ind. Eng. Chem. [Anal.], 1937, 9, 237—238; cf. A., 1936, 949).—Borax can be kept indefinitely over a solution saturated with sucrose and NaCl . The dry crystals undergo about 0.1% change in composition when kept for 1 year in a tightly stoppered bottle. The relative advantages of borax and Na_2CO_3 as acidimetric standards are discussed. E. S. H.

Detection of free chlorine in hypochlorites.—See B., 1937, 540.

Use of sodium hypochlorite [in quantitative analysis]. S. S. COOPER (J. Chem. Educ., 1937, 14, 188—189).—Solutions of NaOCl give more consistent results and are more stable than suspensions of bleaching powder. L. S. T.

Determination of fluorine in natural phosphates. P. M. ISAKOV (Sci. Rep. Leningrad State Univ., 1936, 2, No. 2, 196—212).— H_2SO_4 is added to a mixture of the substance with Fe-Si on a sintered glass plate at 130—140°, and dry air is passed through the plate from below. The reaction gases are passed successively through CrO_3 in conc. H_2SO_4 and aq. KCl , and the HCl produced by decomp. of SiF_4 is titrated. R. T.

Interference of phosphorus in the determination of fluorine. H. V. CHURCHILL, R. W. BRIDGES, and R. J. ROWLEY (Ind. Eng. Chem. [Anal.], 1937, 9, 222).—Double distillation is recommended in the Willard-Winter procedure, using H_2SO_4 first and HClO_4 secondly. E. S. H.

Determination of fluorine in blood and [mineral] waters.—See A., III, 288.

Determination of oxygen in metals.—See B., 1937, 575.

[Apparatus for] determination of sulphur in metals.—See B., 1937, 575.

Determination of sulphur in rubber. Use of tetrahydroxybenzoquinone as a titration indicator.—See B., 1937, 591.

Identity reactions, of a microchemical order, of tellurium. G. DENIGÈS (Compt. rend., 1937, 204, 1256—1258).—(a) Br is diluted to 1/50 by vol. in CHCl_3 and 2 drops are applied to <0.001 g. of Te on glass. After evaporation 1 drop of a 2:1 CHCl_3 - EtOH mixture at 95° is placed on the yellow residue, which is then heated to 35—40°. Hexagonal and octahedral yellow crystals occur on the periphery. (b) 3—4 drops of I in EtOH (10%) are placed on <0.001 and >0.0005 g. of Te . The reddish-brown residue is passed through a flame and microscopic examination shows black crystals of TeI_4 , insol. in CCl_4 , sol. in EtOH and COMe_2 . NH_3 , alkalis, dil. H_2SO_4 , and HCl decompose the bromide and iodide. R. S. B.

Determination of nitrogen peroxide-nitric oxide mixtures by exact gas-analysis methods. A. KLEMENC and W. NEUMANN (Monatsh., 1937, 70, 273—275).—The gas mixture, together with a known

vol. of O_2 , is adsorbed on SiO_2 gel and cooled in liquid air for 15 min. It is then warmed, the NO_2 allowed to distil into a U-tube cooled in liquid air, and the gel heated to expel gases, the vol. of residual O_2 being measured. The NO_2 is titrated with $KMnO_4$.

J. W. S.

Xylenol method for detection of nitrate. F. WERR (Z. anal. Chem., 1937, 109, 81—91).—0.1 g. of substance is dissolved in 100 c.c. of H_2O . 1 c.c. of this solution is treated with 1 drop of *m*-xylenol (I) + H_2SO_4 to give 62.5% of H_2SO_4 , and (I) is nitrated for 15 min. at room temp. The solution is diluted with H_2O , and after 24 hr. 10 c.c., containing any 5-nitro-*m*-xylenol, is distilled into 0.5*N*- $NaOH$, producing a yellow to red coloration. 0.001 mg. of NO_3^- may be so detected. Peroxides must first be decomposed by boiling with alkali; nitrites must also be destroyed, and alkali sulphides pptd. by treatment with $CuSO_4$. Interference by a large excess of other acid radicals is avoided by the initial dilution.

J. S. A.

Polarographic determination of nitrates in presence of sulphate ion. J. P. GOCHSCHTEIN (J. Appl. Chem. Russ., 1937, 10, 521—527).—Polarographic determination of nitrates in presence of SO_4^{2-} is possible when Ba, Ca, or Mg chloride and $LaCl_3$ are added to the solution.

R. T.

New reagent for detecting nitrous acid in drinking water. Y. Y. Ts'ao and F. M. Ko (J. Chinese Chem. Soc., 1937, 5, 55—59).—Benzidine and $\alpha-C_{10}H_7-NH_2$ in $AcOH$ afford a violet colour with 0.1×10^{-6} g. of HNO_2 in 1 c.c. The colour develops slowly and the intensity varies with $[AcOH]$. NO_3^- gives a faint pink colour and other ions interfere.

J. G. A. G.

Analysis of nitrogen compounds in sea-water. K. STOLL (Z. anal. Chem., 1937, 109, 5—15).—Colorimetric methods of determining N compounds are reviewed critically, with reference to their application to sea- H_2O . The sensitivity of the Treadwell-Nessler reagent is increased by addition of $NaCl$; it does not show in sea- H_2O a range of diminished sensitivity between 20 and 80 mg. per cu. m., as found in NH_4Cl solutions. NH_2-N is best determined with the Folin-Giocalteu $Na_2WO_4-Na_2MoO_4-H_3PO_4$ reagent, H_2S being first removed if necessary by addition of $CdCl_2$. Fe^{+++} and Mn^{++++} in excess of 0.1 mg. per litre interfere with the determination of NO_3^- by means of Harvey's reagent.

J. S. A.

Mercurimetric determination of phosphorus pentoxide in phosphates.—See B., 1937, 540.

Determination of arsenite, arsenate, selenite, and selenate present together. J. MILBAUER and J. VODRAZKA (Chem. Listy, 1937, 31, 177—179).— AsO_4^{3-} is determined in presence of other ions by double pptn. as $MgNH_4AsO_4 \cdot 6H_2O$, which is ignited and weighed as $Mg_2As_2O_7$. AsO_3^{3-} is determined similarly in a second portion of solution, after oxidation with any ordinary oxidising agent. A third portion is made acid with $HClO_4$, and $Ba(ClO_4)_2$ is added to ppt. $BaSeO_4$ (Cl^- interferes). $SeO_3^{2-} + SeO_4^{2-}$ is determined by boiling with HCl and N_2H_4 , when Se is quantitatively pptd.

R. T.

Galvanic determination of arsenic in iron ores and ironware.—See B., 1937, 557.

Determination of silicon in iron and steel.—See B., 1937, 563, 564.

Gasometric determination of carbon dioxide in natural carbonates. R. CHANDELLE and H. ETIENNE (Bull. Soc. chim. Belg., 1937, 46, 75—89).—To prevent volatile compounds of S, As, and P from being collected with the CO_2 , the carbonate is decomposed with a mixture of aq. HCl and $K_2Cr_2O_7$ and any traces of the above impurities which have escaped oxidation are removed by $Cd(OAc)_2$ and $AgNO_3$ (cf. A., 1929, 1257).

J. G. A. G.

Determination of carbon disulphide, especially in soil.—See B., 1937, 522.

Rapid determination of total alkalis in ceramic materials.—See B., 1937, 549.

Determining the alkaline constituents of washing powders and solutions.—See B., 1937, 585.

Detection of related elements in presence of one another in one drop. G. KRAMER (Z. anal. Chem., 1937, 109, 16—25).—(i) K or Na, present as sulphate, may be detected in presence of 50 parts of the other by the characteristic habit of the Bi double sulphates. <20% or >70% of Mg does not interfere, but from conc. solutions with 20—70% of $MgSO_4$ lenticular mixed crystals are deposited. Dilution of the solution, or increase of $[SO_4^{2-}]$, inhibits the formation of the mixed crystals. (ii) I' may be detected in presence of Br' and Cl' by pptn. as K_2PtI_6 , which crystallises in characteristic habit after exposure of the drop to gaseous NH_3 .

J. S. A.

Determination of the common and rare alkalis. Wells and Stevens' method. J. C. HILLYER (Ind. Eng. Chem. [Anal.], 1937, 9, 236).—Modified procedure (cf. A., 1935, 54) is recommended when much Cs or Rb is present.

E. S. H.

Analysis of pollucite. R. C. WELLS and R. E. STEVENS (Ind. Eng. Chem. [Anal.], 1937, 9, 236—237; cf. preceding abstract).—Modified procedure for determining alkalis in presence of a large amount of Cs is described.

E. S. H.

Organic reagents in qualitative analysis. III. Analysis of the common metals of the alkaline-earth group and magnesium using 8-hydroxyquinoline. L. LEHRMAN, M. MANES, and J. KRAMER (J. Amer. Chem. Soc., 1937, 59, 941—942; cf. A., 1934, 1192).—A preliminary test, using tannic acid, for the detection of 1 mg. of alkaline-earth metals in presence of large amounts of NH_4 salts is described. For quant. analysis, Ca and Mg are pptd. by 8-hydroxyquinoline in presence of NH_3 and NH_4 salts; Ca is separated from Mg in $AcOH$ by pptg. as CaC_2O_4 , and Mg is repptd. as the 8-hydroxyquinoline salt by making alkaline with NH_3 . Ba and Sr are determined in the solution by the usual methods.

E. S. H.

Determination of calcium sulphate in gypsum.—See B., 1937, 540.

Separation of beryllium in presence of complex tartrates. H. S. MILLER (Ind. Eng. Chem. [Anal.],

1937, 9, 221).—Be may be pptd. from complex tartrate solutions by addition of aq. NH_3 . Separation from Al, Fe, Cu, and Cr is almost quant. The ppt. is gelatinous and tends to co-ppt. crystalloidal matter, thus rendering the procedure unsuitable for precise work.
E. S. H.

Determination of magnesium in aluminium alloys.—See B., 1937, 576.

Determination of zinc in copper alloys containing less than 0.5% of zinc.—See B., 1937, 568.

Potentiometric determination of zinc in electrolytic baths.—See B., 1937, 579.

Simultaneous determination of zinc and zinc sulphide in zinc oxide.—See B., 1937, 540.

Thiocarbamide in quantitative analysis. I. Determination of cadmium and separation of cadmium from zinc. C. MAHR and H. OHLE (Z. anal. Chem., 1937, 109, 1—5).—Cd, but not Zn, is pptd. quantitatively as $[\text{CdX}_2][\text{Cr}(\text{NH}_3)_2(\text{CNS})_4]_2$ by successive addition of 5% aq. $\text{CS}(\text{NH}_2)_2$ (= X) and $\text{NH}_4[\text{Cr}(\text{NH}_3)_2(\text{CNS})_4]$ containing 1% of $\text{CS}(\text{NH}_2)_2$ to a solution $\propto N$ in respect to free acid. The ppt. may be dried with EtOH and weighed, or may be converted into $\text{CrO}_4^{''}$ and determined volumetrically. The ppt. is then dissolved in KCN and oxidised with $\text{KBrO}_3 + \text{H}_2\text{SO}_4$ in presence of MnSO_4 . MnO_2 is removed, $(\text{NH}_4)_2\text{SO}_4$ is added, and the excess of BrO_3^- is removed by boiling before iodometric determination of $\text{CrO}_4^{''}$. Alternatively, the ppt. is ignited and then fused with Na_2O , to convert Cr into $\text{CrO}_4^{''}$.
J. S. A.

Precipitation of metals by means of 8-hydroxyquinoline (oxine). II. Effect of p_H on the precipitation of cadmium, tungsten, and uranium from acetate solutions. H. R. FLECK (Analyst, 1937, 62, 378—383).—The respective optimum p_H vals. for complete pptn. of Cd, W, and U are 5.66—14.58, 4.95—5.65, and 5.71—9.81. p_H -pptn. curves, and suitable quantities of NaOH and AcOH for obtaining these conditions, are given. Separations possible are W—Cd, U—Cd, U—W, U—Mo, and combinations of these with some of the metals previously dealt with (cf. A., 1933, 922).
J. G.

Determination of lead in water.—See B., 1937, 625.

Tetramethyl-*p*-phenylenediamine as a reagent for detection of traces of certain cations of the fourth analytical group. I. K. KULBERG (J. Appl. Chem. Russ., 1937, 10, 567—569).—A drop of reagent [20 mg. of $p\text{-C}_6\text{H}_4(\text{NMe}_2)_2$ in 100 ml. of COMe_2] is added to a drop of solution, when a violet coloration is obtained in presence of $\text{Cu}^{II} \leq 0.08$, $\text{Ag} \leq 0.01$, $\text{Hg}^{II} \leq 1.0$, $\text{Hg}^I \leq 0.5$, or $\text{Fe}^{III} \leq 1.2 \times 10^{-6}$ g.
R. T.

Determination of copper in cuprous acetylide. I. I. STRISHEVSKI (J. Appl. Chem. Russ., 1937, 10, 562—564).— Cu_2C_2 (0.01—0.1 g.) is dissolved in 25 ml. of 6*N*-HCl, excess of approx. 0.1*N*- KBrO_3 in 2% KBr is added, the solution is boiled for 3—5 min., cooled, 2 ml. of 3% PhOH are added to remove Br, followed after 3 min. by 5 ml. of 13.4% KCNS in 2% KI, and the I liberated is titrated.
R. T.

Application of tin amalgam to analysis of alloys. [Determination of copper and tin].—See B., 1937, 570.

Rapid determination of copper in pyrites.—See B., 1937, 567.

Determination of copper in textiles.—See B., 1937, 533.

Improved methods for subdividing cation group II and for separating antimonous and stannic sulphides. A. R. MIDDLETON and G. T. WERNIMONT (J. Chem. Educ., 1937, 14, 184).—The use of NaOH + NaOH saturated with H_2S is recommended for extracting the sulphides of Hg, As, Sb, and Sn IV . Sb_2S_3 and SnS_2 are best separated by H_2S in a solution of controlled p_H and saturated with NaCl.
L. S. T.

Detection of rare earths by absorption and fluorescence. H. GOBRECHT and R. TOMASCHEK (Ann. Physik, [v], 29, 324—331).—The absorption spectrum of the solid, infra-red absorption spectrum, and fluorescence spectrum of the solid or solution are sensitive for the detection of rare earths. Limiting concns. for the detection by these methods of Nd, Sm, Dy, Eu, and Tb are given.
O. D. S.

Rapid identification of actinium, radiothorium, and mesothorium, by their γ -radiation. (MLLE.) C. CHAMIÉ (Compt. rend., 1937, 204, 1328—1330).—The ratio of the intensities of the γ -radiation due to the unknown source and to a tube containing Ra is measured at various distances from the ionisation chamber. If the unknown source has a γ -radiation softer than that due to Ra this ratio increases with increase in the distance. If the γ -radiation is harder the ratio decreases with increasing distance. The method is applied in identifying Ac, radio- and mesothorium.
H. J. E.

Rapid determination of alumina by the hydroxyquinoline method.—See B., 1937, 541.

Determination of aluminium in steel etc.—See B., 1937, 563, 564.

Determination of manganese in ores.—See B., 1937, 573.

Determination of ferrous oxide in rocks and minerals. V. SMIRNOV and N. AIDINJAN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 353—356).—0.5 g. of the finely-powdered sample is decomposed by 10 c.c. of H_2SO_4 (50 vol.-%) and 10 c.c. of HF (40%) under a layer of PhMe or of paraffin wax in PhMe. The mixture is then poured into H_2O (400 c.c.) and the Fe^{II} titrated with KMnO_4 in presence of H_3BO_3 . Results for serpentine, granodiorite, quartz-rock, porphyrite, syenite, and garnet are in accord with or show higher $[\text{FeO}]$ than those obtained by Pratt's method.
J. W. S.

7-Iodo-8-hydroxyquinoline-5-sulphonic acid as a reagent for the colorimetric determination of ferric iron in biological products. Y. C. YIN (J. Chinese Chem. Soc., 1937, 5, 51—54).—The org. matter is first removed by heating with a mixture of H_2SO_4 , HNO_3 , and HClO_4 (cf. A., 1933, 43). The Fe content of rice has been determined. J. G. A. G.

7-Iodo-8-hydroxyquinoline-5-sulphonic acid as a reagent for the colorimetric determination of ferric iron. J. H. YOE and R. T. HALL (J. Amer. Chem. Soc., 1937, 59, 872—879).—The reagent ("Ferron") serves to detect 1 part of Fe^{+++} in 10^7 parts of solution in the absence of Cu^{++} or salts that hydrolyse easily or yield coloured ions. The influence of p_{H} has been studied and the optimum experimental conditions have been determined; ageing and change of temp. have no influence on the colour reaction. The solubility of "Ferron" in H_2O , EtOH , AcOH , COMe_2 , $\text{H}_2\text{O-EtOH}$, and $\text{H}_2\text{O-COMe}_2$ has been determined at 25° . E. S. H.

Micro-testing of silicates for ferrous and ferric oxides.—See B., 1937, 540.

Colour reactions of sarcosine and alanine with ferric salts.—See A., II, 280.

Determination of cobalt. Volumetric determination, and determination in steel. B. S. EVANS (Analyst, 1937, 62, 363—377).—Co, as well as Ni (cf. Glasstone and Speakman, A., 1930, 445), may be determined by KCN-titration in presence of B_2O_3 . The Co complex cyanide is completely oxidised and rendered inert by boiling with H_2O_2 , whilst the Ni complex may be decomposed by prolonged boiling with a large excess of slightly acid NH_4 citrate and may then be titrated selectively. Co may be separated from interfering metals present in steels by double pptn. with 1:2- $\text{NO-C}_{10}\text{H}_6\text{-OH}$ in presence of HNO_3 , $\text{CO}(\text{NH}_2)_2$, and H_3PO_4 , Cu being removed by an intermediate treatment with H_2S . J. G.

Permanganatometric determination of nickel. J. LEDRUT and L. HAUSS (Bull. Soc. chim., 1937, [v], 4, 1136—1141).—Ni is pptd. as oxalate in presence of HCO_2H at approx. 70° , the ppt. is washed with 25% HCO_2H , dissolved in 10% H_2SO_4 , and the liberated $\text{H}_2\text{C}_2\text{O}_4$ titrated with 0.1N- KMnO_4 . The presence of NO_3^- or NH_4^+ does not affect the titration. The solubility of NiC_2O_4 in HCO_2H diminishes and then increases with increase in $[\text{HCO}_2\text{H}]$, min. solubility occurring in 25—30% HCO_2H . C. R. H.

Determination of nickel in steel containing cobalt and copper.—See B., 1937, 564.

Behaviour of chromium towards 8-hydroxyquinoline. O. HACKL (Z. anal. Chem., 1937, 109, 91—93).— Cr^{+++} is slowly and incompletely pptd. by 8-hydroxyquinoline (I) in AcOH solution. CrO_4^{--} is pptd. completely from dil. HCl by (I) in AcOH . J. S. A.

Colour reaction with 2:2'-dipyridyl for molybdenum. A. S. KOMAROVSKI and N. S. POLUEKTOV (J. Appl. Chem. Russ., 1937, 10, 565—566).—2 drops of 3% 2:2'-dipyridyl in EtOH and 1 drop of a solution of 10 g. of SnCl_2 in 20 ml. of conc. HCl are added to a drop of the neutral or slightly acid solution, when a reddish-violet coloration is obtained in presence of $\approx 4 \times 10^{-7}$ g. Mo. Re^V , As^V , and V^V do not interfere, whilst in presence of W tartaric acid should be added. R. T.

Photometric determination of molybdenum in steel.—See B., 1937, 564.

Determination of tin in ores.—See B., 1937, 570.

Precipitation and determination of vanadates. E. CARRIÈRE and H. GUITER (Compt. rend., 1937, 204, 1339—1340).—Pptn. of a boiling solution of Na or NH_4 vanadates at p_{H} 3.5—4.5 by BaCl_2 yields $\text{Ba}(\text{VO}_3)_2$, which is appreciably sol., even in presence of EtOH . At p_{H} 4.5—10.8 $\text{V}_2\text{O}_5 \cdot x\text{BaO}$ ($x = 1-3$), and at p_{H} 10.8—11.4 $\text{Ba}_3(\text{VO}_4)_2$, are formed. At p_{H} 4—4.6, AgNO_3 yields AgVO_3 , while $\text{Pb}(\text{OAc})_2$ at p_{H} 4.3—5 yields $\text{Pb}_3(\text{VO}_4)_2$. Gravimetric determination of vanadates as $\text{Pb}_3(\text{VO}_4)_2$ is more precise than that as AgVO_3 . H. J. E.

Determination of antimony in lead-rich alloys.—See B., 1937, 572.

Determination of bismuth in ores, metallurgical products, etc.—See B., 1937, 573.

[Determination of free acid in] sodium aurichloride. J. KEDING (Dansk Tidsskr. Farm., 1937, 11, 107).—After determination of AuCl_3 with excess of KI and $\text{Na}_2\text{S}_2\text{O}_3$, KIO_3 is added to the solution, when free HCl yields I_2 by the reaction: $6\text{HCl} + \text{KIO}_3 + 5\text{KI} = 6\text{KCl} + 3\text{H}_2\text{O} + 3\text{I}_2$. M. H. M. A.

Identification of gold, platinum, and palladium and differentiation of alloys.—See B., 1937, 571.

Automatic thermostat for constant temperature between 10° and 70° . STADLER (Chem.-Ztg., 1937, 61, 437—438).—A thermostat using hot and cold H_2O for heating or cooling the bath is described. J. S. A.

Thermostat. V. E. PARKER, P. E. HATFIELD, and A. STRICKLER (J. Chem. Educ., 1937, 14, 172—173). L. S. T.

Determination of the thermal conductivity of gases. C. M. MASON and R. M. DOE (J. Chem. Educ., 1937, 14, 182—184).—Directions for the construction and use of a simple thermal conductivity cell are given. L. S. T.

[Apparatus for determining the b.p. curve of two miscible liquids.] M. CHATELET (J. Chim. phys., 1937, 34, 140). F. A. A.

Di-*n*-heptyl phthalate as a bath liquid in determining m.p. of organic compounds. P. P. T. SHAH and C. H. KAO (J. Chinese Chem. Soc., 1937, 5, 86—88).—The ester, b.p. $264^\circ/26$ mm., was prepared by refluxing $o\text{-C}_6\text{H}_4(\text{CO}_2\text{O})$, $n\text{-C}_7\text{H}_{15}\text{-OH}$, PhMe , and conc. H_2SO_4 . It is suitable for m.p. baths at $<300^\circ$. For m.p. $>320^\circ$, 20% of beeswax must be added. J. G. A. G.

Electrically heated Thiele's [m.p.] tube. P. GESTEAU (Bull. Soc. chim., 1937, [v], 4, 951—954). F. L. U.

Comparative method for measurement of critical temperatures of individual liquids and mixtures. W. SWIENTOSLAWSKI and S. PIEZCZEK (Bull. Acad. Polonaise, 1937, A, 72—80).—The method of Harand (A., 1935, 437) is adapted for simultaneous measurement of crit. temp. of several liquids. Results are recorded for $\text{COMe}_2\text{-CS}_2$ mix-

tures; the azeotrope at crit. conditions, 234.3°, contains 72.1% COMe_2 . F. J. L.

Resistance thermometry below 1.0° abs. J. F. ALLEN and E. S. SHIRE (*Nature*, 1937, **139**, 878—879).—Resistance-temp. curves for a phosphor-bronze wire down to a susceptibility temp. of 0.027° show that such a resistance thermometer can be conveniently used in the temp. range below 1° abs. L. S. T.

X-Ray diffraction equipments and methods. C. S. BARRETT (*Amer. Soc. Test. Mat., Symp. on Radiography*, 1936, 193—229).—A review. R. B. C.

Vacuum spectrograph for X-rays. C. M. OLSON and W. C. PIERCE (*Rev. Sci. Instr.*, 1937, [n], **8**, 147—150).—A simple Siegbahn-type instrument is constructed with a special method of rocking the crystal giving accurate control of rocking angle and ready adjustment to any desired range. A Hg seal is used instead of a taper joint for crystal mounting, provision is made for adjusting the X-ray beam after evacuation, and the instrument may be used for large or small dispersion, with or without evacuation, or may be adapted for use as a vac. Debye-Scherrer camera. N. M. B.

Tube for the production of monochromatic fluorescent X-rays. W. C. PIERCE, C. M. OLSON, and D. P. MACMILLAN (*Rev. Sci. Instr.*, 1937, [ii], **8**, 145—147).—With the instrument described a high-intensity monochromatic beam is obtained by reflexion from a halite crystal mounted within the tube. A slight modification allows the production of fluorescent X-rays from samples mounted close to the focal spot within the tube. N. M. B.

Semi-instantaneous X-ray patterns. Rotating anticathode X-ray tube. G. FOURNIER, H. GONDET, and M. MATHIEU (*J. Phys. Radium*, 1937, [vii], **8**, 160—164).—For obtaining Debye-Scherrer patterns of substances in a very short time interval, the tube described embodies a rotating, water-cooled anticathode with simple grease-lubricated cone joint. N. M. B.

Direct reading comparator for spectra. L. G. HOXTON and D. W. MANN (*J. Opt. Soc. Amer.*, 1937, **27**, 150—154).—A modified comparator allows direct reading, in the evaluation of spectrograms, of $\lambda\lambda$ or wave nos. which are ordinarily computed by the Hartmann formula. The apparatus, operating on the principle of geometric projection, is a mechanical equiv. of the Hartmann formula, and is applicable to grating as well as prismatic spectra. N. M. B.

Method of absorption spectrography for the detection of the detailed structure of absorption spectra. E. R. HOLIDAY (*J. Sci. Instr.*, 1937, **14**, 166—172).—In order to obtain with one exposure the optimum density of the plate in the whole λ region where structure occurs, the plate is moved, by means of a cam, past the spectral image of the slit of a spectrograph at a logarithmically increasing rate. The plate is suited, by use of a reference spectrum, to the quant. estimation of absorption. N. M. B.

Measuring spectral negatives and at the same time increasing the sensitivity of spectral analytical methods. W. VAN TONGEREN (*Chem. Weekblad*, 1937, **34**, 340).—Very weak lines in a spectrogram are more easily seen under the microscope in oblique incident light. By using this method of observing a negative, the sensitivity of spectrum analysis is increased and there is less eye-strain. S. C.

Spectrograph for iron analysis.—See B., 1937, 564.

Photometric comparison of absorption lines. A. A. FROST, D. W. MANN, and O. OLDENBERG (*J. Opt. Soc. Amer.*, 1937, **27**, 147—149).—The difficulty of measuring the intensities of intense narrow absorption lines is overcome by a microscopic method by which, with a 90° reflecting prism, the two spectra are photographed on a single plate, lines of equal intensity are selected, and relative concns. of quanta are computed from the Boltzmann formula. Suitability for the quant. chemical analysis of gaseous reactions is claimed. N. M. B.

Apparatus for obtaining very intense diffraction diagrams of crystalline powders with monochromatic radiation. A. GUINIER (*Compt. rend.*, 1937, **204**, 1115—1116).—A specially constructed crystal grating, giving sharp focussing with wide slit apertures, is employed. A. J. E. W.

Employment of contoured graphs of structure-factor in crystal analysis. W. L. BRAGG and H. LIPSON (*Z. Krist.*, 1937, **95**, 323—337).—The structure-factor expressions for the general projection of a structure on a suitable plane are quite few in no., and can be represented graphically, so that the labour in evaluating reflected intensities for various at. arrangements is greatly reduced. Formulae and typical graphs are given. B. W. R.

Adjustable specimen holder for a Debye-Scherrer camera. F. W. JONES and H. LIPSON (*J. Sci. Instr.*, 1937, **14**, 177—178).—A rapid and accurate method of centring a specimen to obtain increased line sharpness and to decrease exposure time is described. N. M. B.

Organic reagents in colorimetry. Micro-technique for search of new organic colour reactions. J. H. YOE (*J. Chem. Educ.*, 1937, **14**, 170—172). L. S. T.

Photo-electric measurement of the optical constants of metals. J. BOR (*Nature*, 1937, **139**, 716—717). L. S. T.

Capillary chemistry and fluorescent light microscopy. E. A. HAUSER and C. J. FROSCH (*J. Opt. Soc. Amer.*, 1937, **27**, 110—111).—A review. H. J. E.

Glass colour filters for special applications. H. P. GAGE (*J. Opt. Soc. Amer.*, 1937, **27**, 159—164).—A method of calculating the spectrophotometric data for any thickness of glass from those for a given thickness is described. Calculation is made of the thickness required for a combination of a special yellow and a new type blue-green glass for correcting the spectral response of a photonic cell to the spectral luminosity response of the eye. N. M. B.

Application of a spark recorder for the measuring of the radiation of chemical reactions. A. I. DANILENKO and M. M. DJATSCHENKO (Ukrain. Biochem. J., 1937, 10, 169—176).—The Greinacher recorder is suitable for registering the radiation from chemical reactions and may be used, *e.g.*, for studying the fermentation processes of a yeast emulsion.

W. O. K.

Time lag of the vacuum photo-cell. R. A. HOUSTON (Proc. Roy. Soc. Edinburgh, 1937, 57, 163—171).—A detailed account of work already reported (this vol., 113).

A. J. M.

Influence of luminous intensity on the sensitivity of photo-electric counters. J. ROULLEAU (Compt. rend., 1937, 204, 1191—1192; cf. A., 1935, 722).—The sensitivity of the counters, measured with monochromatic light, is const. only for low incident light flux, and decreases with higher intensities.

A. J. E. W.

Illuminator for opaque objects. G. D. HANNA (J. Roy. Microscop. Soc., 1937, [iii], 57, 11—14).—The apparatus described consists of a concave mirror and low-wattage, conc. filament lamp, and provides great intensity of illumination evenly covering the field of view, absence of excessive heat, no trace of colour aberration, and diffusion of the image of the filament entirely under control.

N. M. B.

Colorimetric determinations with the Lovibond tintometer. J. VAN AS (Pharm. Weekblad, 1937, 74, 695—706).—The Lovibond tintometer is used for the determination of aq. $K_2Cr_2O_7$, diluted saffron tincture, and vitamin-A in cod-liver oil. The results are very satisfactory.

S. C.

Precipitation reaction viewing apparatus. L. C. NICHOLLS and J. C. THOMAS (Brit. J. Exp. Path., 1937, 18, 55—59).—A parallel beam of small area and high intensity is transmitted vertically upwards through the pptn. tube. Scattering occurs only in the presence of a ppt.

R. M. M. O.

Variable-voltage auto-transformer. D. H. COOK (Ind. Eng. Chem. [Anal.], 1937, 9, 248—249).—The device provides a means of varying voltages from 35 to 180 in small steps, with an output of 10 amp. Applications are discussed.

E. S. H.

Potentiometer for measuring very small resistances. P. KAPITZA and C. MORTON (J. Sci. Instr., 1937, 14, 165—166).—Troubles due to residual e.m.f. were reduced by breaking both battery circuits, instead of the galvanometer circuit, to test for balance, and by making reduction of the battery potential by a fixed potential divider follow, instead of precede, that by the potentiometer box itself.

B

Concentration cell measurements in physical chemistry. C. S. HOYT (J. Chem. Educ., 1937, 14, 185—187).—Apparatus and technique for the measurement of the e.m.f. of Ag concn. cells is described. Sp. effects due to strain in Ag electrodes can be eliminated by heating before use until a thin layer of molten Ag flashes across the surface.

L. S. T.

Electrolysis vessel for quantitative electrolytic analysis. L. WOLF (J. pr. Chem., 1937,

[ii], 148, 205—209).—A vessel, in which a Winkler's net electrode is supported on a thick wire passing through a ground-glass stopper at the base, is described.

E. W. W.

Effect of rectified current from a Tunger valve on the electrolytic separation of heavy water. T. ASADA and E. HONDE (Nature, 1937, 139, 885—886).—A comparison of the increase in $[D_2O]$ by electrolysis with d.c. and with current rectified with a Tunger valve shows that the former is the more efficient for separating D_2O . An explanation is advanced.

L. S. T.

Geiger-Müller counter.—See A., III, 262.

β -Ray counter. J. HALPERN and O. C. SIMPSON (Rev. Sci. Instr., 1937, [ii], 8, 172).—A counter constructed of a Cu cylinder Sn-soldered to Cu-to-Pyrex seals on glass ends with a W wire stretched through the middle combines the sensitivity of Al-to-glass and the reliability of Cu-to-glass cylinder counters.

N. M. B.

Electron refraction camera with observation microscope adjustable in a vacuum. F. SOHOSZBERGER and K. SCHWARZ (Z. Elektrochem., 1937, 43, 324—326).—A description and diagram are given.

F. L. U.

Gamma-ray radiography and its relation to X-ray radiography. N. L. MOCHEL (Amer. Soc. Test. Mat., Symp. on Radiography, 1936, 116—155).—The technique of γ -ray radiography is described.

R. B. C.

Calibration of weights. F. H. HURLEY, jun. (Ind. Eng. Chem. [Anal.], 1937, 9, 239—243).—A crit. discussion.

E. S. H.

Weighing out small amounts of hygroscopic materials. E. V. BRITZKE and E. HOFFMANN (Mikrochem., 1937, 22, 121—123).—A form of "bottling apparatus" is described, suitable for semi-micro-scale working.

J. S. A.

Continuous determination of the specific gravity of cyanide solution. A. A. LINEVSKI (Technika, 1935, No. 32).—A continuously acting areometer is described.

CH. ABS. (e)

Measurement of density with a float. S. TORAISHI and I. OUCHI (J. Chem. Soc. Japan, 1935, 56, 1325—1328).—The relation between the concn. (0.119—0.575%) and d of H_2SO_4 , the change in d of Au sols in an electric field, and the change in d of $PhNO_2$ placed between condenser plates were measured by means of a float.

CH. ABS. (e)

Simple micro-method for determining specific gravity of liquids and solid bodies. (Limits and error of evaluation.) J. GICKLHORN (Mikrochem., 1937, 22, 1—14).—A capillary tube, containing a drop of the liquid of which the d is required, is immersed in a solution (*e.g.*, H_2O or standard sucrose) of known d . d may be derived from the rate of movement of the interface or of efflux of the liquid by comparison with calibration data.

J. S. A.

Limiting density method for determining mol. wt. of gases. E. MOLES (J. Chim. phys., 1937,

34, 49—69; cf. this vol., 57).—In using this method the most accurate procedure is to determine the d of the gas at pressures, p , between 0.5 and 1 atm. The val. of d/p is a linear function of p even for readily liquefied gases and the ratio of the val. for $p = 0$ to the corresponding val. for O_2 gives the ratio of the mol. wt. to that of O_2 . Various improvements in the experimental technique permit the determination of d with a precision of about 10^{-5} . Applications of the method are described. R. C.

Applications of and devices for quantitative mineral micro-analysis. F. HECHT (Österr. Chem.-Ztg., 1937, 40, 243—249).—A review.

E. S. H.

Accuracy of graduated pipettes. A. LASSIEUR (Ann. Chim. Analyt., 1937, [iii], 19, 117—123).—The delivery error of pipettes is discussed. For liquids with η approximating to that of H_2O , errors are small, but for viscous liquids the drainage error is excessive.

J. S. A.

Twenty-plate laboratory bubble-cap still for low-boiling materials. J. H. BRUUN and S. D. WEST (Ind. Eng. Chem. [Anal.], 1937, 9, 247—248).—A still for the prep. of highly purified compounds, boiling below room temp., is described. E. S. H.

100-Plate semi-automatic laboratory bubble-cap still of glass. J. H. BRUUN and W. B. M. FAULCONER (Ind. Eng. Chem. [Anal.], 1937, 9, 192—194).—A still of high separating power is described. Efficiency tests are recorded. E. S. H.

Water distillation apparatus. V. G. MOISEEV (Zavod. Lab., 1937, 6, 110—111).—Apparatus, involving electrical heating and air cooling, is described.

R. T.

Apparatus [for vacuum distillation] with normal ground-glass joints. M. R. RAMBAUD (Bull. Soc. chim., 1937, [v], 4, 711—713).

H. J. E.

Analysis of gas mixtures by means of rectifying distillation. W. WUSTROW (Z. anal. Chem., 1937, 108, 305—309).—A rectifying column for the fractional distillation of condensed gases at liquid air temp. enables a sharp separation to be made between the components of hydrocarbon mixtures.

J. S. A.

Receiver changer for small-scale vacuum distillations. W. V. THORPE and R. T. WILLIAMS (J. Sci. Instr., 1937, 14, 178—180).—A modified Bruhl's apparatus operates in vac. The receivers, mounted in a revolving carrier, are rotated as required by a magnetically-actuated claw engaging with a ratchet wheel attached to the hollow spindle of the carrier.

N. M. B.

Siphon-starting device. T. W. CHANDLER (Ind. Eng. Chem. [Anal.], 1937, 9, 249).

E. S. H.

Apparatus for extraction of liquids with immiscible solvents of greater density. L. H. BRIGGS (Ind. Eng. Chem. [Anal.], 1937, 9, 250).—The apparatus is designed for extracting large amounts of aq. solutions containing plant material with $CHCl_3$ or C_2HCl_3 .

E. S. H.

Metal chimney for fusions. L. J. CURTMAN and L. LEHRMAN (Ind. Eng. Chem. [Anal.], 1937, 9, 225).—Tinplate apparatus is described. E. S. H.

Sealed stirrer. L. JOSEPH (Ind. Eng. Chem. [Anal.], 1937, 9, 212).—Modified apparatus is described. E. S. H.

Natural vacuum filtration. G. G. ELISEEV (Zavod. Lab., 1937, 6, 111—112).—An inverted funnel with filter is pressed against the rim of a cylinder containing the liquid to be filtered, and the cylinder and funnel are inverted; filtration of any vol. of liquid then proceeds gradually without requiring any further attention. R. T.

Apparatus for rapid mass vacuum filtration. A. G. BOGDANTSCHENKO (Zavod. Lab., 1936, 5, 878).

R. T.

Apparatus for automatic washing, filtration, and extraction. G. KAPSENBERG (Chem. Weekblad, 1937, 34, 403—416).—Several forms of automatic vac. filtration and percolation apparatus in glass are described. S. C.

Inverted air-driven ultracentrifuge. J. W. BEAMS and F. W. LINKE (Rev. Sci. Instr., 1937, [ii], 8, 160—161).—The air turbine is below instead of above the rotor, and the rotating parts are supported on an air cushion below the turbine. N. M. B.

Method of placing extra necks on round-bottom flasks. W. O. OSBORN, E. ROHRMAN, and J. D. ZECH (Rev. Sci. Instr., 1937, [ii], 8, 170).—In a method with special advantages for large 3—5-litre flasks the red-hot glass on the flask is sucked into the neck joint by momentary connexion through the neck to a vac. reservoir. N. M. B.

Quartz-to-Pyrex joint. A. H. WEBER and C. B. BAZZONI (Rev. Sci. Instr., 1937, [ii], 8, 170—171).—An adaptation of Palmer's method (cf. A., 1935, 1342), using molten $AgCl$, is described. N. M. B.

Modified Smythe vacuum leak. C. B. BAZZONI (Rev. Sci. Instr., 1937, [ii], 8, 171; cf. this vol., 50).—A simplified form of Smythe's apparatus has a glass scale tube parallel to the porcelain tube for accurate measurement and adjustment of the Hg height. N. M. B.

Jones reductor. R. G. MEYERS (Philippine J. Sci., 1937, 61, 447).—Modified apparatus, using a fritted glass filtration pad, for use in Fe determinations is described. E. S. H.

[Lecture experiments.] H. A. J. SCHOUTISSEN (Chem. Weekblad, 1937, 34, 347—351).—Precise details are given for carrying out lecture experiments to illustrate (1) the formation of MgO and Mg_3N_2 when Mg is burned in air, (2) the basicity of MgO and its slow neutralisation with HCl , (3) the "salting out" of PbI_2 with KI , (4) the prep. of NO_2 in the electric arc, (5) the prep. of P from phosphorite, SiO_2 , and C, (6) decomp. of NH_3 to N_2 and H_2O and its synthesis from N_2 and H_2 with a W catalyst, (7) the etching of glass with HF , and (8) the formation of C_2H_4 from CH_4 in the electric arc. S. C.

Life and chemical theories of Dr. Edward Bancroft. C. A. BROWNE (J. Chem. Educ., 1937, **14**, 103—107).—Historical. L. S. T.

Ole Rømer's and Fahrenheit's thermometers. (A) K. MEYER. (B) J. N. FRIEND (Nature, 1937, **139**, 585—586, 586).—Historical (cf. this vol., 269). L. S. T.

Finnish chemists. V. OJALA and E. R. SCHIERZ (J. Chem. Educ., 1937, **14**, 161—165).—Historical. L. S. T.

Thomas Cooper as an itinerant chemist. E. V. ARMSTRONG (J. Chem. Educ., 1937, **14**, 153—158).—Biographical. L. S. T.

Geochemistry.

Oxygen in solar prominences. T. ROYDS and A. L. NARAYAN (Current Sci., 1937, **5**, 531—532).—Photographs showing the O triplet partly reversed in prominences, but not strongly enough to appear as bright lines against the sky background spectrum, have been obtained. The presence of O in prominences disproves their being supported by radiation pressure. N. M. B.

Determination of atmospheric ozone at the altitude of 9620 m. by a fluorescence method. M. KONSTANTINOVA-SCHLESINGER (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 187—188).—The concn. of O₃ at 9620 m. is 2.63×10^{-7} g. per litre (n.t.p.) and accords with the vertical distribution calc. by Dobson (A., 1934, 600). O. D. S.

Gases, sublimation and encrustation products, and thermal waters of the "ladoses" of Merapi. M. HARTMANN (Vulkan. Seismol. Mededeel. No. 12, Dienst Mijnbouw Ned. Ind., 1933, 117—131).—The sublimation products consisted of chlorides and sulphates. The escaping gas contained CO₂, H₂S, SO₂, and COS. CH. ABS. (e)

Geology of Texas Panhandle oil and gas field. H. ROGATZ (Bull. Amer. Assoc. Petroleum Geol., 1935, **19**, 1089—1109).—The gas is divided into two zones, "sweet" and "sour." The latter contains 2—500 grains of H₂S per 100 cu. ft. CH. ABS. (e)

Occurrence of heavy water in nature. E. H. RIESENFELD (Svensk Kem. Tidskr., 1937, **49**, 113—123).—Variations in the *d* of waters from natural sources are explained by the theory of differential evaporation. M. H. M. A.

Conductivity of natural mineral waters. III. P. S. TUTUNDZIĆ (Bull. Soc. Chim. Yougoslav., 1936, **7**, 141—148).—Conductivity and analytical data are recorded for the H₂O of a no. of mineral springs. R. T.

Organic phosphorus in sea-water from the English Channel. L. H. N. COOPER (J. Marine Biol. Assoc., 1937, **21**, 673—675).—Analyses of org. P and As in samples of sea-H₂O in the neighbourhood of Plymouth show that the amount (0.44 mg.-atom per cu. m.) is approx. const. with the time of year, and is also approx. the same as that in the N. Atlantic. At least half of the so-called "org. P" is arsenite. A. J. M.

Bromine and silica contents of [water from] Riga Bay and the Baltic Sea. E. ZARINS and J. OZOLINS (Latvij. Univ. Raksti, 1936, **3**, 321—327).—Results are tabulated. J. W.

Mineral water of Udine. Geology, analysis, and physico-chemistry. G. BRAGAGNOLO (Annali

Chim. Appl., 1937, **27**, 59—93).—The geology of the province is discussed and chemical and physico-chemical analysis of its 12 waters, of which 2 are mineral and 10 indifferent mineral, are given. The H₂O is usually sulphurous but occasionally ferruginous. The former waters have notable therapeutic action but the mineral content is variable. L. A. O'N.

Discovery of boron in Central Asia. A. G. BERGMAN (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 345—347).—A no. of lakes in the Zeravshan basin and in the Kenimekh region contain about 0.01% of B₂O₃. Lake Sultan-Sandzhar, in the Amu-Darys delta, contains about 0.24% B₂O₃, together with NaCl about 22—24, Na₂SO₄ 2—4, KCl >0.4, and MgSO₄ >0.2%. The springs feeding the lakes contain salts in the same proportions. J. W. S.

Fluorine content in the rivers of the U.S.S.R. A. P. VINOGRADOV, V. V. DANILOVA, and L. S. SELIVANOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **14**, 361—364).—The [F] of the H₂O from several large Russian rivers is >0.2 mg. per litre. H₂O from boreholes near the Chibin apatite deposits, however, contains about 1.7 mg. of F per litre. Conditions in this region therefore favour the occurrence of mottled enamel among the population. J. W. S.

Organic constituents of a recent deposit from Chincoteague Bay, Virginia. R. C. WELLS and E. T. ERICKSON (U.S. Geol. Surv., Prof. Paper 186-D, 69—79).—The sediment contained 0.7% of org. matter consisting mainly of chlorophyll, cholesterol, S compounds, algin, wax (with fractions, m.p. 89—175°), humic acids sol. and insol. in EtOH, pentosans, acid-sol. material, and fatty acid derivatives (partly Ca and Mg salts) (free fatty acids, m.p. 37—71°). F. O. H.

Principles of distribution of chemical elements in minerals and rocks. V. M. GOLDSCHMIDT (J.C.S., 1937, 655—673).—A lecture. Four principal stages of geochemical evolution of matter are considered. The first corresponds with the effect of affinity properties of the elements during the very early history of the earth, whereby partition of the elements between ionic, semi-metallic, metallic, and vapour phases occurred. The second stage, during crystallisation, represents the segregation of elements which is controlled especially by ionic size and ionic charges. The third stage is chiefly the formation of sedimentary rocks in which the distribution of the elements is governed largely by their ionic potentials. The fourth stage is controlled by the activities of living organisms. J. G. A. G.

Thermoluminescence of crystallophyllian rocks. L. ROYER (Compt. rend., 1937, 204, 991—993; cf. this vol., 333).—The use of thermoluminescence in estimating the age of the rocks is discussed. A. J. E. W.

Mendeleev's periodic law and its application to geochemistry. A. E. FERSMAN (Trav. Congr. Jubil. Mendeléeu, 1936, 1, 419—454).—A lecture. J. W. S.

Spectroscopic determination of rare-earth elements in some minerals found in the U.S.S.R. S. A. BOROVIK (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 351—352).—Spectroscopic examination of the mineral concentrates over the range 2500—3500 Å. shows the presence of La, Ce, Sm, Nd, Eu, Gd, Y, Yb, and Dy in Russian apatite (I), locherite (II), and carburane (III), of Pr and Er in (I) and (II), and of Ho in (I) and (III). J. W. S.

Exploration of the mineral world with the aid of X-rays. W. L. BRAGG (J. Phys. Radium, 1936, [vii], 7, 321—325).—A general account of the mineral world and cryst. structure, the role of different elements and atoms in the structure of crystals, and the principal types and densities of minerals are considered. W. R. A.

Differential geochemical prospection of mineral deposits. V. DE GOLOUBINOFF (Compt. rend., 1937, 204, 1075—1077).—The content of a particular element in a mineral deposit can be approx. predicted by comparing the content of this element in neighbouring eruptive rocks with the "clark" or mean frequency of the element in the earth's crust. The cases of Sn and Au are discussed. A. J. E. W.

Electrical conductivity of lepidocrocite. G. COHN (Z. Elektrochem., 1937, 43, 341; cf. A., 1935, 1303).—Lepidocrocite has a smaller sp. resistance (min. val. at room temp. 3×10^6 ohms) than goethite. F. L. U.

Antlerite from Kazakhstan, Siberia. F. V. TSCHUCHROV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 95—96).—Veinlets in sandstone at Krestovozdvizhensk, Kasakhstan, contain blue linarite which is mostly altered to green earthy antlerite. Analysis agrees with $\text{CuSO}_4 \cdot 2\text{Cu}(\text{OH})_2$. Pb from the linarite has given rise to associated lead-ochre and cerussite. L. J. S.

Formation of the alkaline rocks of Julianehaab (Greenland). E. WEGMANN (Compt. rend., 1937, 204, 1125—1127). A. J. E. W.

Cathodo-luminescence spectrum of danburite. S. IMORI and J. YOSHIMURA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 225—228).—The spectrum of $\text{CaO} \cdot \text{B}_2\text{O}_3 \cdot 2\text{SiO}_2$ with 7 hr. exposure shows three intense band groups over 660—560 mμ, with weak diffused bands in the green, blue, and violet regions. Data for 27 lines are tabulated and discussed. N. M. B.

Mineral resources of Uruguay. J. P. PITAMIGLIO (Rev. mens. asoc. rural Uruguay, 1935, No. 1, 42—44).—A summary. CH. ABS. (e)

Glaserite and syngenite of Stebnik, Poland. A. LASZKIEWICZ (Arch. min. soc. sci. Varsovie, 1934, 10, 117—121).—Glaserite is associated with syngenite

and Glauber salt. It forms very pure prismatic crystals ($3\text{K}_2\text{SO}_4 \cdot \text{Na}_2\text{SO}_4$; a 5.635, b 7.27 Å.).

CH. ABS. (e)

Polish bentonite from the vicinity of Krzemieniec, S.E. Poland. Z. SUJKOWSKI (Arch. min. soc. sci. Varsovie, 1934, 10, 98—116).—The composition is similar to that of the French and American minerals. CH. ABS. (e)

Influence of original composition on the micas in the metamorphic rocks of the Hsienshuissu series, near Mt. Tahoshang, S. Manchuria. M. SAWATARI (Mem. Ryojun Coll. Eng., 1935, 8, 67—84). CH. ABS. (e)

Density and structure of zircon. K. CHUDOBA and M. VON STACKELBERG (Z. Krist., 1937, 95, 230—246).—The considerable variations in d and optical properties which zircon exhibits are summarised. The different specimens show substantially the same X-ray lattice, with only slight changes of lattice constns. The possible influence of impurities on the lattice is discussed. B. W. R.

Tin ores of Banca, Billiton, and Singkep, Malay Archipelago. I, II. N. WING-EASTON (Econ. Geol., 1937, 32, 1—30, 154—182).—The deposits are described and their origin is discussed.

Tin in micas. S. A. BOROVIK (Compt. rend. Acad. Sci. U.R.S.S., 1937, 14, 349).—From spectroscopic data and from the solubility in HF it is concluded that the Sn contained in mica enters into the crystal lattice of the latter. No Sn could be detected in the quartz and felspar constituents of the granite. J. W. S.

"Permanent" magnetisation of basalts. E. THELLIER (Compt. rend., 1937, 204, 876—879).—The direction and intensity of the magnetisation of five specimens of basalt changed appreciably after three days under the action of the earth's field. A. J. E. W.

Hydrothermal leaching of iron ores of the Lake Superior type—a modified theory. J. W. GRUNER (Econ. Geol., 1937, 32, 121—130).—It is proposed that the chief source of the hot waters was meteoric. Most of the difficulties encountered in adhering either to the weathering or to the magmatic H_2O hypothesis then disappear. L. S. T.

Magmatic differentiation. C. N. FENNER (J. Geol., 1937, 45, 158—168).—Difficulties encountered in attempting to explain all the phenomena of differentiation of igneous magmas by a single process are discussed. Special consideration is given to the theory of differentiation by crystal fractionation. L. S. T.

Petrology of Barnavave, Carlingford, I.F.S. An occurrence of quartz-bearing syenite and its xenoliths. S. R. NOCKOLDS (Geol. Mag., 1937, 74, 125—132).—Chemical analyses of the syenite and the limestone xenolith are recorded, and probable reactions discussed. L. S. T.

Gneissic complex of the Darjeeling district, Bengal. S. K. RAY (Quart. J. Geol. Min. Met. Soc. India, 1935, 7, 25—44).—Analyses of sillimanite-gneiss, feldspathic mica-schist, and the Kalimpang gneiss are given. CH. ABS. (e)

Almandite from some deposits of N. Caucasus and the Ukraine. D. SERDIUTSCHENKO (Mem. Soc. russe Min., 1933, 62, 97—101).—Analyses are given.

CH. ABS. (e)

Todorokite, a new manganese mineral from the Todoroki mine, Hokkaido, Japan. T. YOSHIMURA (J. Fac. Sci. Hokkaido Imp. Univ., 1934, [iv], 2, 279—287).—Todorokite is monoclinic. It is sol. in HCl and in hot conc. H_2SO_4 . The formula is $3(Mn_2O_3 \cdot MnO_2 \cdot 2H_2O) \cdot 2RO \cdot MnO_2 \cdot 2H_2O$, where R = Ca, Mg, Ba, and Mn^{II} .

CH. ABS. (e)

Activatable kaolinites. J. DE LAPPARENT (Compt. rend., 1937, 204, 937—939).—Earths possess decolorising properties and are susceptible to the action of activating agents when they contain mols. having linked Si and OH ions.

A. J. E. W.

Crystal structure of kaolinite, $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$, and the composition of anauxite. S. B. HENDRICKS (Z. Krist., 1937, 95, 247—252).—X-Ray and electron diffraction data from oriented aggregates of kaolinite and anauxite confirm the suggestions of Gruner (A., 1932, 987; 1933, 45, 892).

B. W. R.

Composition of "burnt-rock" from Kusnezsk-Bechen. B. BELIKOV (Trav. Inst. petrog. Acad. Sci. U.R.S.S., 1933, 4, 91—101).—Chemical and mineralogical data show that the rock was formed by the melting of a clay-bearing sandstone.

CH. ABS. (e)

Weathering of rocks and the composition of clays. A. SALMINEN (Soil Div. Centr. Agr. Expt. Sta. Finland, 1935, No. 40, 1—149).—Data are given for the chemical, mineralogical, and mechanical composition of Finnish clays from various localities. Weathering changes are discussed (cf. B., 1937, 476).

CH. ABS. (e)

Concretions in the Fayetteville shale. A. W. GILES and A. M. JONES (J. Geol., 1937, 45, 204—213).—The shale consists largely of carbonaceous clay shale with limestone lentils. It contains pyrite and is calcareous locally. Argillaceous, calcareous, limonitic, and gypsiferous concretions occur sporadically throughout its entire thickness; the last-named are relatively rare. The calcareous concretions are clay-ironstone. Chemical reactions concerned in the formation of these concretions are discussed.

L. S. T.

Geology of glauconite. E. W. GALLIHER (Bull. Amer. Assoc. Petr. Geol., 1935, 19, 1569—1601).—The change from biotite to glauconite is discussed, with special reference to the deposits in Monterey Bay, Cal.

CH. ABS. (e)

Dutch metalliferous region Moersnet-Bleyberg-Stolberg-Limbourg. P. DE WIJKERSLOOTH (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 292—294).—From geochemical evidence it is concluded that this region should be very rich in metallic minerals.

J. W. S.

Petrography of some rocks from the South Orkney islands and the Antarctic Archipelago. D. STEWART, jun. (Amer. Min., 1937, 22, 178—194).—The mineralogical compositions of numerous igneous, sedimentary, and metamorphic rocks are tabulated.

L. S. T.

Regeneration of amphiboles from their melts at normal pressure. D. P. GRIGORIEV and E. W. ISKULL (Amer. Min., 1937, 22, 169—177).—Pyroxenes crystallise from the dry melts of fused amphiboles. After fusion with 5% of CaF_2 , however, amphiboles of modified chemical composition crystallise. F acts in the melts in the same way as OH, which it replaces in the crystal structure of amphiboles which crystallise out.

L. S. T.

Origin of "salitre." M. CARRANZA (Bol. Soc. Quím. Peru, 1936, 2, 199—203).—S. American nitrate deposits are probably not of volcanic origin (cf. Stoklasa, B., 1923, 715) as they do not contain free S and other elements usually present. It is suggested that HNO_3 formed in cloud by the action of ultra-violet rays and electric discharge reacts with wind-borne NaCl of marine origin, the HCl being oxidised by O_3 to perchlorate.

F. R. G.

Fibrous tourmalines from the Mysore State. K. Y. S. IYENGAR (Current Sci., 1937, 5, 534—535).—Results of an analysis of one cryst. and three fibrous specimens are tabulated. No definite relation to the cause of fibrous structure was found.

N. M. B.

Anisotropy of polish-hardness of barytes. H. TERTSCH (Z. Krist., 1937, 95, 296—307).—The polish-hardness (i.e., rate of removal of material by grinding in a certain direction) is determined for barytes for various directions of the prism cleavage plane and the basal plane. Results are compared with those from scratch-hardness measurements.

B. W. R.

Microphotometric study of X-ray powder diagrams of certain feldspars. T. ITO and H. INUZUKA (Z. Krist., 1937, 95, 404—408).—The most intense powder line shows a doubling with some of the feldspars of presumably non-homogeneous composition, which is not shown by the simpler feldspars such as albite or perthite.

B. W. R.

Water content of magmas. J. GILLULY (Amer. J. Sci., 1937, [v], 33, 430—441).—A discussion. Analysis of average igneous rocks of the several types indicate that the average magma contains ± 1.5 or probably 2% of H_2O , these being min. figures appropriate to shallow zones in the earth. Primary H_2O content of siliceous magmas is these figures, and 4% for basalts and possibly 8% for granitic magmas at depth are much more in keeping with geologic data than the much lower estimates that have been made.

L. S. T.

Twin elements in Travancore monazite. R. DE (Separate, Dacca, 1937, 18 pp.).—The isolation from Travancore monazite of twin elements presumed to be an isotope of Po and eka-I, the methods of separation from each other, and their chemical properties are described.

L. S. T.

Geology of the Eastern portion of the Raichur Do-ab with special reference to the granodioritic phases of the Dharwar series of rocks. S. K. MUKHERJEE, L. S. KRISHNAMURTHY, C. MAHADEVAN, and H. S. KRISHNAMURTHY (J. Hyderabad Geol. Survey, 1936, 3, 1—82).—Analyses of brine samples from the Eastern portion of the Raichur Do-ab are also included.

L. S. T.

Identification of rocks by reflected light. F. E. WRIGHT (Amer. Min., 1936, 21, 200). L. S. T.

Pseudowollastonite and wollastonite solid solutions with diopside and akermanite. J. F. SCHAIER and N. L. BOWEN (Amer. Min., 1936, 21, 193).—Both of the systems $\text{CaSiO}_3\text{--CaMgSi}_2\text{O}_6$ and $\text{CaSiO}_3\text{--Ca}_2\text{MgSi}_2\text{O}_7$ are binary. Wollastonite (I) ($\beta\text{-CaSiO}_3$) forms a series of solid solutions with diopside (II) extending to approx. 22% of (II). Pseudowollastonite (III) ($\alpha\text{-CaSiO}_3$) takes little, if any, (II) into solid solution. As a result of this difference in concn. of the solid solutions the inversion (I) (III) is increased from approx. 1130° to 1368° , and (I) solid solutions appear in equilibrium with liquid. The eutectic between pure (II) and (I) solid solution occurs at 1358° and 62 wt.-% of (II). The system $\text{CaSiO}_3\text{--Ca}_2\text{MgSi}_2\text{O}_7$ [akermanite (IV)] is of the simple eutectic type with no solid solution. A eutectic occurs between (III) and (IV) at 1398° and 57 wt.-% of (IV), and the inversion of (I) to (II) is at approx. 1130° for all compositions of this system. L. S. T.

Origin of kernite and borax in the Kramer borate field, California. W. T. SCHALLER (Amer. Min., 1936, 21, 192).—The kernite has formed from the borax by recrystallisation due to increased temp. and pressure. The borax may have been derived from the change of ulexite to colemanite. L. S. T.

Plagioclase, pyroxene, and olivine variation in the Stillwater [igneous] complex. H. H. HESS (Amer. Min., 1936, 21, 198—199).—Detailed changes in composition have been studied. The Mg : Fe ratio of the pyroxenes and olivines decreases from the base of the complex upwards. With a few reversals, apparently due to the additions of new magma, the plagioclases change from An_{85} near the base of the plagioclase-bearing rocks to An_{60} at the highest point exposed. L. S. T.

Alteration of gabbro near Philadelphia, Pennsylvania. E. H. WATSON (Amer. Min., 1936, 21, 200—201).—The widespread chemical reactions that have occurred are described. L. S. T.

I. Catamorphism of igneous rocks under humid tropical conditions. II. Basic rocks. III. Intermediate rocks. IV. Acidic rocks. J. B. HARRISON (Brochure, Imp. Bur. Soil Sci., Harpenden, 19 pp.).—I. Surface weathering of igneous rocks causes catamorphism of the rock minerals by processes of hydration and oxidation, with production of hydrated Al and Fe silicates, and hydrated Fe oxides, together with residual quartz and other resistant minerals.

II. Primary laterisation is due to the action of carbonated ground waters, which set free SiO_2 , Ca, Mg, Na, and K minerals, leaving most of the Fe as limonite, and the Al as gibbsite. Under temperate conditions there is a gradual and less complete degradation, accompanied by oxidation, hydration, and leaching, with formation of complex hydrated silicates.

III. The intermediate stages in the degradation of epidote-quartz-diorite are reviewed.

IV. Under tropical conditions acidic rocks do not undergo primary laterisation, but gradually change

through catamorphism into pipe- and pot-clays, or more or less quartziferous and impure kaolins. Lateritic earths, or even pot-clays, may undergo desilication with formation of concretionary and superficial masses of bauxite. CH. ABS. (e)

Perowskite, uhligite, and dysanallyte. O. ZEDLITZ (Fortschr. Min., 1936, 20, 66—68; Chem. Zentr., 1936, i, 3480).—X-Ray investigation shows uhligite to be a perowskite with Ti replaced by Al and Zr. The accepted a cell dimension should be doubled in each case ($a = 7.66$ and 7.64 Å, respectively). J. S. A.

Lead glance, schapbachite, matildite. P. RAMDOHR (Fortschr. Min., 1936, 20, 56—57; Chem. Zentr., 1936, i, 3479).—Matildite is identical with schapbachite (I), which probably possesses a high-temp. regular form isomorphous with Pb glance. Cell dimensions of (I) are a 8.08, b 7.82, c 5.65 Å.

J. S. A.

Pumpellyite, a common hydrothermal and secondary mineral in basic rocks. H. W. QUITZOW (Zentr. Min., 1936, A, 39—46; Chem. Zentr., 1936, i, 3480).—The occurrence of pumpellyite is discussed. J. S. A.

Grigoriev's synthetic phlogopite. F. MACHAT-SCHKI (Zentr. Min., 1936, A, 55—58; Chem. Zentr., 1936, i, 3480).—The synthetic phlogopite represents an intermediate between the biotitic brittle micas and true phlogopite. J. S. A.

Auromiridium. O. ZVJAGINTZEV (Sotzial. Rekons. Nauk., 1935, No. 3, 176; cf. A., 1935, 190).—The mineral (Ir 52, Os 25, Au 19, Ru 3.5%) is a natural alloy, forming grains of 0.2—2 mm. diameter. CH. ABS. (e)

Geology and paragenesis of the gold ores of the Howey Mine, Red Lake, Ontario. W. B. MATHER (Econ. Geol., 1937, 32, 131—153).—The petrography of the rocks, the sequence of events leading up to ore deposition, the ore deposits, and the mineralisation are described and discussed. L. S. T.

Lead-uranium ratio of Beaverlodge pitchblende. G. P. BAXTER and M. E. AVERILL (J. Amer. Chem. Soc., 1937, 59, 705).—The ratio is 0.0486.

E. S. H.

Determination of the exact age of a Canadian uraninite. F. H. BRUNER (J. Physical Chem., 1937, 41, 365—373).—From the Pb-U ratio, 0.0529, and in absence of Th, the age calc. from Holmes' formula is 3.9×10^8 years. The Pa-U and Ac-Io ratios are 0.04, but since verification of the absence of common Pb is lacking, a more accurate age estimate cannot be made. C. R. H.

Investigation of the interior of the earth by emanation determinations. G. AECKERLEIN (Physikal. Z., 1937, 38, 362—370).—The investigation of the Rn content of H_2O and of rocks from a boring at different depths down to 123 m. is described. Fissures give rise to increased [Rn], due partly to a higher [Rn] of the rocks, but also to the ease with which the Rn can escape. A. J. M.

Salinity in relation to soil and geology in Raichur district. L. MUNN (J. Hyderabad Geol. Survey, 1936, 3, 83—90). L. S. T.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

AUGUST, 1937.

Spectrum of hydrogen. W. M. VENABLE (J. Opt. Soc. Amer., 1937, 27, 155—158).—An analysis shows that the wave nos. of the band lines are accounted for numerically, with high precision, as due not to the simple differences between a large no. of independent levels, but to the compounding of simple differences between a comparatively small no. of levels, including the primary levels; also that definite series relationships exist between all the levels, binding them into a single mathematical system. N. M. B.

Paschen series of hydrogen and deuterium. N. NAGAOKA and T. MISHIMA (Proc. Imp. Acad. Tokyo, 1937, 13, 95—97).—Using an electrodeless discharge in H_2 and D_2 , the Paschen series of D were photographed for the range 10,938—8467 Å., giving members $m = 6$ —17. N. M. B.

Intensity variations of the green and red oxygen lines and the presence of the ϵ system in aurora and the light of the night sky. L. VEGARD (Z. Physik, 1937, 106, 108—131).—Interference measurements show the presence of the O_2 lines 1S_0 — 1D_2 and 1D_2 — $^3P_{012}$ in aurora and the light of the night sky. The relative intensity of the red triplet increases with increasing height. Indirect sunlight can give rise to a marked intensity variation. Excitation of the red line 6300 occurs directly as well as from the transition 1S_0 — 1D_2 . The intensity variations may be explained by the same processes suggested to explain the intensification of the red triplet of O_2 by excitation with activated N_2 . The appearance of bands of the ϵ system indicates that N_2 in the A (ϵ^3) state occurs in considerable concn. H. C. G.

Line contours of the atmospheric oxygen bands. C. W. ALLEN (Astrophys. J., 1937, 85, 156—164).—The breadth and structure of the atm. O lines have been determined from the curves of growth of the A, B, and α bands in the solar spectrum. L. S. T.

Line strengths in neon I. C. W. UFFORD (Astrophys. J., 1937, 85, 249—250).—Line strengths for the transition array $2p^54p$ — $2p^54s$ of Ne I have been calc. in intermediate coupling, including the electrostatic and spin-orbit interactions. L. S. T.

New effect in the glow discharge in argon. K. GEIGER (Z. Physik, 1937, 106, 17—34).—The glow discharge between a cylindrical anode and two symmetrically disposed cathodes at different negative potentials with respect to the anode is studied in A at pressures of a few mm. with cathodes of brass and Fe. The larger current flows between the pair of electrodes at the lower p.d., due to the special pro-

perty of differential ionisation of electrons in A, which creates a greater ion density near the electrodes at the lower potential. L. G. G.

Sign of the magnetic moment of the ^{39}K nucleus. R. A. FISHER (Physical Rev., 1937, [ii], 51, 887).—The K resonance lines excited by projecting an at. beam of K into an electrodeless discharge in A show a doublet structure with 0.016 cm^{-1} separation. The weaker component lies on the lower-frequency side, confirming the inversion of the hyperfine multiplet and indicating a negative nuclear magnetic moment for ^{39}K (cf. Jackson, A., 1936, 397). N. M. B.

Interference measurements of wave-lengths in the ultra-violet spectrum of iron. W. F. MEGGERS and C. J. HUMPHREYS (J. Res. Nat. Bur. Stand., 1937, 18, 543—557).—Measurements on 252 lines (3498—2101 Å.) are recorded. H. J. E.

New absorption band of bromine vapour at high temperatures. L. DABROWSKI (Acta phys. polon., 1935, 3, 301—305; Chem. Zentr., 1936, i, 3267).—At 940° and 270 mm. a weak continuous band appears at 2930 Å., which is already known in emission. A similar band at 3460 Å. is found with I at 775°, but no such Cl bands can be detected. J. S. A.

Variation of continuous absorption of bromine vapour with density and temperature. J. PATKOWSKI (Acta phys. polon., 1935, 3, 385—391; Chem. Zentr., 1936, i, 3267—3268).—As with Cl_2 , the Br absorption bands broaden and increase in intensity as the temp. is raised. J. S. A.

Fluorescence bands of cadmium vapour. J. SWIETOSLAWSKA (Acta phys. polon., 1935, 3, 261—270; Chem. Zentr., 1936, i, 3271).—Data are recorded for the van der Linen bands excited at 650°. The long- λ limit of the bands varies with the λ of the exciting light. J. S. A.

Monochromatically excited fluorescence of cadmium vapour. W. KAPUSCINSKI (Acta phys. polon., 1935, 3, 537—545; Chem. Zentr., 1936, i, 3271).—The structure diminishes as the λ of the exciting radiation is increased above 2800 Å. With exciting light of 2980 Å. a structureless anti-Stokes fluorescence band is emitted. J. S. A.

Broadening of absorption lines of iodine vapour by foreign gases. W. OPECHOWSKI (Acta phys. polon., 1935, 3, 307—322; Chem. Zentr., 1936, i, 3268).—Under interferometric resolution of individual rotational lines, the effect of additions of N_2 and A is to increase the total absorption of each line. J. S. A.

Hyperfine structure of bands. W. KESSEL (*Acta phys. polon.*, 1935, 3, 513—516; *Chem. Zentr.*, 1936, i, 3266).—Interferometric measurements revealed no hyperfine structure in the principal doublet series of the I fluorescence spectrum. J. S. A.

Role of absorption of the exciting line in resonance spectra. II. W. KESSEL (*Acta phys. polon.*, 1935, 3, 505—512; *Chem. Zentr.*, 1936, i, 3266; cf. A., 1935, 137).—In the excitation of the I and Te resonance spectra by Hg lines, the structure of the absorption is identical with that for emission. J. S. A.

Absorption spectrum of bromine in the near infra-red. O. DARBYSHIRE (*Proc. Roy. Soc.*, 1937, A, 159, 93—109).—The photography and analysis of the absorption system of bromine have been extended from 7600 to 8180 Å. Vibrational consts. have been redetermined. G. D. P.

Law for the emission of continuous spectrum radiation (white light) from xenon tubes. M. LAPORTE (*Compt. rend.*, 1937, 204, 1559—1560; cf. this vol., 336).—The intensity of the radiation from a section of a Xe tube is independent of the angle of inclination to the normal to the tube over the range 0—70°. J. W. S.

Intensity relations of some lines of the mercury spectrum. I. L. FABELINSKI (*Physikal. Z. Sovietunion*, 1937, 11, 390—403).—The ratio of the intensities of the lines 3655 and 3125 Å., which have a common upper level with the strong inter-combination line 5770 Å., and of the lines 3023 and 3652 Å. having a common upper level with the weak inter-combination line 4349 Å., have been measured under conditions such that reabsorption was negligible. The deviation from the val. calc. from the formula of Sommerfeld and Heisenberg for the first pair is > for the second. From intensity measurements at high and low pressures a lower limit is obtained for the reabsorption of the lines 3125 and 3652 Å. O. D. S.

Absorption of the mercury 5461 Å. line in bromine vapour. S. MROZOWSKI (*Acta phys. polon.*, 1935, 3, 447—454; *Chem. Zentr.*, 1936, i, 3268).—Interferometric measurements show that two Br absorption lines fall within the $\lambda\lambda$ covered by the chief component of the Hg 5461 Å. line. The hyperfine structure components also show a general weakening. With Cl, no line absorption occurs in the rays of the 5461 Å. line, but only a general weakening of the whole line. J. S. A.

Structure of the mercury resonance line 2537 Å. S. MROZOWSKI (*Helv. phys. Acta*, 1936, 9, 27—32; *Chem. Zentr.*, 1936, i, 3270).—The intensity ratios of the components of the 2537 Å. line have been redetermined, errors due to reabsorption being avoided. J. S. A.

Absorption measurements in band spectrum of mercury vapour. S. MROZOWSKI (*Acta phys. polon.*, 1935, 3, 215—233; *Chem. Zentr.*, 1936, i, 3270—3271).—Absorption measurements are recorded for ten $\lambda\lambda$ between 2749 and 1990 Å. At const. temp., the absorption deviates considerably from proportionality to the v.p. J. S. A.

Re-emission in band fluorescence of mercury vapour. F. ANIELA (*Acta phys. polon.*, 1935, 3, 323—327; *Chem. Zentr.*, 1936, i, 3270).—Evidence is advanced that re-emission of the exciting line is due to mols. of the vapour, and not to scattering by atoms, as postulated by Frank. J. S. A.

Regularity along a series in the variation of the action cross-section with energy discrepancy in impacts of the second kind. O. S. DUFFEN-DACK and W. H. GRAN (*Physical Rev.*, 1937, [ii], 51, 804—809).—Measurements of the enhancement of the intensities of Pb spark spectrum lines, excited by impacts of the second kind with Ne ions, relative to their intensities in electron impact excitation are plotted against the energy discrepancies of the spectral terms in which the lines originate. The form and characteristics of curves for different series are compared and discussed. N. M. B.

Central intensities of Fraunhofer lines. C. W. ALLEN (*Astrophys. J.*, 1937, 85, 165—180).—The central intensities of 91 Fraunhofer lines in the red and infra-red regions of the solar spectrum have been measured. L. S. T.

Excitation and emission of limits of the atomic continuous spectra. H. BARTELS (*Z. Physik*, 1937, 105, 704—724).—Theoretical. L. G. G.

Spectral intensity of black-body radiation in the short-wave region. E. KRETSCHEMANN (*Z. Physik*, 1937, 105, 645—657).—Theoretical. L. G. G.

Excitation of characteristic X-rays by protons. M. S. LIVINGSTON, F. GENEVESE, and E. J. KONOPINSKI (*Physical Rev.*, 1937, [ii], 51, 835—839).—A qual. study of the X-rays produced by 1.76 m.e.v. protons shows that these rays are the characteristic K and L radiations from the targets used. The variation of intensity with proton energy and with at. no. is in agreement with theory. N. M. B.

Moseley diagram of X-ray term values. D. COSTER (*Physica*, 1937, 4, 418—425).—The Moseley curves are brought up to date, and the effect of screening on the slope of the curves is discussed. F. J. L.

K-Rays of boron. A. HAUTOT and J. SERPE (*J. Phys. Radium*, 1937, [vii], 8, 175—178).—The K-radiation emitted by B has been investigated for both powdered and cryst. B. The radiation consists of a single band which commences on the short- λ side at 65.8 ± 0.4 Å., and increases to a max. not far from this edge, the exact position of the max. being dependent on temp. The width of the band is 8.5 ± 0.75 Å. B crystallised at lower temp. gives a wider band, with ≤ 3 subsidiary max. Powdered B, prepared by Moissan's method, gives a single band, but its structure varies with temp. of prep. The K-radiation of B excited in B_2O_3 and $Na_2B_4O_7$ is more complex than that of elementary B. Assuming that the conductivity electrons of B form a freely moving electron gas, moving in a field of const. potential, the above results indicate that there are three conductivity electrons per atom of B at high temp. At low temp. the assumption of free electrons is no longer sufficient, and this may be due to a change in

the cryst. lattice of B at the lower temp. The increasing freedom of the conductivity electrons as the temp. is raised is confirmed by the conductivity of B increasing with rise of temp. A. J. M.

Soft X-rays and photo-electrons from nickel at different temperatures. S. RAO (Proc. Roy. Soc., 1937, A, 159, 283—294).—The photo-electric efficiencies of Cu and Ni exposed to soft X-rays are independent of temp. between 30° and 500°. The soft X-ray intensity from polycryst. Ni increases with rise of temp. No abrupt change occurs at the Curie point. G. D. P.

Semi-optical lines in X-ray spectra. A. T. MAITRA (Indian J. Physics, 1937, 11, 77—89).—Semi-optical lines in the *K*, *L*, and *M* series of X-ray spectra arising from an electron ejected from an inner level of an atom going to a vacant, partly vacant, or optical level, followed by a transition from one of these levels, have been identified. F. J. L.

X-Ray emission spectra of sulphides and sulphates. J. VALASEK (Physical Rev., 1937, [ii], 51, 832—834; cf. A., 1935, 1046).—An improved water-cooled clamp for holding the specimen on the target is described. From measurements of *K*β λ for the alkaline-earth sulphates and for the semi-conducting sulphides Cu₂S, CuS, Sb₂S₃, MoS₂, Ag₂S, and Bi₂S₃ and λ data for the *K* absorption edges, the energy gap between the occupied and unoccupied zones in the crystals is obtained, and results for sulphates and corresponding sulphides are compared. To account for changes in emission λ from compound to compound a non-uniform displacement of energy levels is needed in addition to the Madelung energy (cf. Slater, this vol., 8). N. M. B.

Influence of magnetic field on Compton effect. B. MILIANCZUK (Acta phys. polon., 1935, 3, 133—142; Chem. Zentr., 1935, i, 3264).—The lack of effect of magnetic fields on the Compton effect is justified theoretically. J. S. A.

Field emission and cathodic disintegration of thoriated tungsten. E. W. MULLER (Z. Physik, 1937, 106, 132—140).—The field emission of surfaces activated either by a wire containing Th or by evaporation from a Th source is dependent largely on the thickness of the coating. The empirical φ^3 law, found to hold with Ba-covered surfaces, holds also for Th surfaces. Bombardment of the surface with ions of A, H, and N results in uniform disintegration of the Th surface. Deactivation of the Th surface with O₂ was observed; the expulsion energy of the poisoned surface was 6 e.v. H. C. G.

(A) **Determination of the Townsend ionisation coefficient α for mixtures of neon and argon.** A. A. KRUTHOF and F. M. PENNING. (B) **Townsend ionisation coefficient and some elementary processes in neon with small admixtures of argon.** A. A. KRUTHOF and M. J. DRUYVESTEYN. (C) **Mobility of electrons in neon.** M. J. DRUYVESTEYN (Physica, 1937, 4, 430—449, 450—463, 464—466).—(A) The ionisation coeff. $\eta = \alpha/E$ (E —field in volts per cm.) of mixtures of A and Ne has been measured and shows a max. val., 0.037, at 0.1% A, and $E/p_0 = 3V/cm. mm.$ (p_0 = pressure in mm. Hg).

(B) The probability that an excited Ne atom will produce an A ion is calc.

(C) The drift velocity of electrons in Ne is calc. from the velocity distribution obtained in the preceding paper. F. J. L.

Polarisation of electrons by scattering in crystals. E. DAVID (Z. Physik, 1937, 105, 747—749; cf. Weisskopf, A., 1935, 557).—Mathematical. Polarisation is so small that it could not be detected experimentally. H. C. G.

Damped electron waves in crystals. J. C. SLATER (Physical Rev., 1937, [ii], 51, 840—846).—Mathematical. Electrons in solids suffer inelastic impacts if their energy is $>$ the resonance energy of the atoms in the crystal, resulting in strong damping of the electron beams, with consequent broadening of the reflected peaks about the Bragg scattering angles, and reduction of the reflexion coeff. An empirical damping const. is introduced, and, from electron diffraction theory, equations for energy and reflexion coeff. are deduced. N. M. B.

Wave functions in a periodic potential. J. C. SLATER (Physical Rev., 1937, [ii], 51, 846—851).—Mathematical. Approx. solutions of the motion of an electron in a periodic potential, as a crystal lattice, are developed by a new method. N. M. B.

Scattering of fast electrons by thin foils. H. SAEGUSA and K. KIKUCHI (Sci. Rep. Tohoku, 1937, 25, 817—828).—The angular distribution of electrons (10, 20, and 30 kv.) scattered by Al, Ni, Ag, and Au foil is recorded at 30—110°. The scattering is mainly elastic, and the distribution is not in complete agreement with that calc. from Rutherford or Wentzel theories, indicating that the Coulomb field does not account for all the scattering. F. J. L.

Electron gases in a magnetic field. E. LIFSCHITZ (Physikal. Z. Sovietunion, 1937, 11, 141—156).—A kinetic equation is derived for a gas of charged particles in a magnetic field; it leads to expressions for the relaxation time for the appearance of Maxwellian distribution, and for heat-conductivity in the gas. The expansion of a unit group of charged particles under the influence of Coulombic repulsion is obtained as a function of time. L. G. G.

Secondary electron emission of metals with low work function. H. BRUINING and J. H. DE BOER (Physica, 1937, 4, 473—477).—Secondary electron emission is not determined primarily by the work function; it is greater for compounds than for pure metals. "Free" conduction electrons contribute relatively little to secondary emission; bound electrons do so more readily. F. J. L.

Annihilation of positive electrons. G. C. WICK (Atti R. Accad. Lincei, 1936, [vi], 23, 352—357).—Theoretical. O. J. W.

Behaviour of an ion cloud about a dipolar molecule under the influence of an alternating field. S. OKA (Proc. Phys.-Math. Soc. Japan, 1935, 17, 454—466).—Theoretical. CH. ABS. (e)

Ionisation of potassium atoms at heated platinum and tungsten surfaces. H. MAYER (Z.

Physik, 1937, 105, 725—733).—The positive ion current is measured between a glowing wire of Pt or W and a coaxial cylinder, all of known dimensions, in saturated K vapour at known temp. The ionisation yield for the metal pairs K-Pt and K-W is given by $g - N_i/N_a$, where N_a is the no. of atoms of K striking, and N_i is the no. leaving, the glowing surface in unit time. $g_{K-Pt} = 51 \pm 3\%$ and $g_{K-W} = 56 \pm 3\%$.

L. G. G.

Recombination of ions in air at high pressures. P. KRAUS (Ann. Physik, 1937, [v], 29, 449—472).—The variation of the recombination coeff. (α) of ions in air with pressure (p) has been investigated for p up to 140 kg. per sq. cm. α reaches a max. at about 1.7 kg. per sq. cm. and then decreases rapidly with increasing p . The linear relationship between α and p for $p < 1$ atm. becomes inaccurate for p a little > 1 atm. At higher p , $\log \alpha \propto \log p$. A. J. M.

Application of molecular beams to the production of light ions. R. PLANTOL (Compt. rend., 1937, 204, 1632—1633; cf. A., 1935, 599).—Beams of H and N ions have been produced. The H beam gave intense Balmer lines, indicating a preponderance of at. ions.

R. S. B.

Chemical at. wt. of carbon. A. F. SCOTT and F. H. HURLEY, jun. (Science, 1937, 85, 544).—Hydrolysis of BzCl under 50% aq. C_5H_5N and titration with Ag gave, from the analyses of five samples, a preliminary val. of 12.010.

L. S. T.

Abundance ratio of isotopes of potassium in animal tissues.—See A., III, 251.

Wilson cloud-chamber investigation of the α -particles from uranium. W. M. RAYTON and T. R. WILKINS (Physical Rev., 1937, [ii], 51, 818—825).—The mean ranges of U α -particles, determined in terms of the mean range of Po α -particles, gave the ratios U-I/Po, 0.6904 ± 0.0007 and U-II/Po, 0.8357 ± 0.0008 , corresponding with mean air ranges U-I 2.63 and U-II 3.18 cm. on the basis of Po 3.80 cm. The straggling coeff. of the Po α -particle reference group agreed satisfactorily with experiment. There is evidence of a new α -emitting U isotope. The mean air range of the new group is approx. 2.9 cm., and possible identification with Wilkins' Ac series parent (cf. A., 1928, 1302) and with Dempster's (cf. A., 1935, 1048) is discussed.

N. M. B.

Ranges and straggling coefficients of α -particles. A. KING and W. M. RAYTON (Physical Rev., 1937, [ii], 51, 826—831; cf. preceding abstract).—A review and evaluation of analytical and graphical methods of range determination reveals several types of errors. The superiority of the mean range over the extrapolated range, as a measure, is shown. An analysis taking account of these errors is developed and applied to data for Po.

N. M. B.

Dependence of the β -spectra of radioactive elements on atomic number. A. I. ALICHANIAN, A. I. ALICHANOV, and B. S. DZELEPOV (Physikal. Z. Sovietunion, 1937, 11, 204—224).—The form of β -spectra is shown to be markedly dependent on the at. no. of the radioactive substance. The curve for the energy distribution of electrons from Ra-E has no definite max., whereas in the case of light radioactive

substances such as radioactive Al and P the curve starts at the origin and passes through a sharp max.

H. C. G.

Pair production in β -decomposition. L. TISZA (Physikal. Z. Sovietunion, 1937, 11, 425—444).—Mathematical. The probability of pair production is calc. for the limiting cases of high and low β -particle energy. The energy distribution of the pairs in the latter case is given.

O. D. S.

Theory of β -transformation and nuclear forces. II. G. WENTZEL (Z. Physik, 1937, 105, 738—746; cf. this vol., 60).—Mathematical. The forces binding a hypothetical spinless particle in a nucleus are examined. The relation between the asymmetry of β -spectra and the energy levels concerned is discussed.

H. C. G.

Absorption of γ -rays measured by their photo-effect in beryllium. J. ROTBLAT (Nature, 1937, 139, 963—964).—The absorption curves of Ra-C γ -rays in Pb, Cu, and Al are exponential and correspond with a mean quantum energy of 1.96×10^6 e.v., showing, in agreement with recent mass data, that only the hardest groups of these γ -rays can extract neutrons from Be nuclei.

L. S. T.

Rate of emission of γ -ray energy by radium-B and radium-C, and by thorium-B and thorium-C'. L. H. GRAY (Proc. Roy. Soc., 1937, A, 159, 263—283).—Measurements are made which determine the total ionisation produced in air by the complete absorption of γ -rays from Ra-B + C and from Th-B + C'. The shape of the absorption-distance curve for the Th-C' γ -rays agrees with expectation, but the curve for Ra-B + C indicates a proportion of hard radiation relatively $>$ previous estimates.

G. D. P.

Scattering of γ -rays. Z. BAY, G. PAPP, and Z. SZEPESTI (Naturwiss., 1937, 25, 366).—A new method for the investigation of the scattering of γ -rays using thin metal foils is described. The results of determinations with Al agree with the Klein-Nishina formula. Comparison of the scattering curves of γ -rays at Al and Pb shows a nuclear scattering for the latter independent of angle. The scattering coeff. for Pb is $(15.8-20.6) \times 10^{-25}$ sq. cm., in good agreement with the val. calc. on the assumption of dematerialisation of positrons (Jaeger *et al.*, A., 1936, 404).

A. J. M.

Deuteron-deuteron reaction. R. B. ROBERTS (Physical Rev., 1937, [ii], 51, 810—818).—A detailed account of investigations previously reported (cf. this vol., 108). Results for fast neutrons from a thick D_3PO_4 target bombarded by 100-kv. deuterons and for Ra-Be neutrons are compared. Excitation curves are given and discussed, and variation of neutron yield with thickness of paraffin surrounding the source is examined. The abs. yield of protons is one proton for 6×10^6 deuterons.

N. M. B.

Temperature equilibrium of C neutrons. O. R. FRISCH, H. VON HALBAN, jun., and J. KOCH (Nature, 1937, 139, 922—923).—The absorption by Ag of C neutrons emerging from a paraffin block at several temp. has been measured. The results are discussed.

L. S. T.

Scattering of neutrons in matter. V. L. S. ORNSTEIN (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 464—470; cf. this vol., 107).—Mathematical. The distribution in direction of the velocity of neutrons scattered by protons is discussed.

O. D. S.

Motion of neutrons through paraffin. L. S. ORNSTEIN and G. E. UHLENBECK (Physica, 1937, 4, 478—486).—Mathematical.

F. J. L.

Relation between effective cross-sections for slow neutrons. R. FLEISCHMANN (Z. Physik, 1937, 105, 698—703).—The mathematical relation between the effective cross-section of the resonance neutrons of a substance when absorbed by B, and that of thermal neutrons when absorbed by the substance, is discussed.

H. C. G.

Scattering of slow neutrons at atomic lattices. G. C. WICK (Physikal. Z., 1937, 38, 403—406).—Theoretical.

A. J. M.

Velocity of slow neutrons. J. R. DUNNING, G. B. PEGRAM, G. A. MITCHELL, G. FINK, and E. SEGRÈ (Atti R. Accad. Lincei, 1936, [vi], 23, 340—342).—Group C neutrons have a velocity $\sim 2.2 \times 10^5$ cm. per sec., i.e., of the order of magnitude due to thermal agitation.

O. J. W.

Scattering of fast neutrons by protons. N. N. DMITRIY (Physikal. Z. Sovietunion, 1937, 11, 225—238).—Mathematical. It is shown that the shape of the potential energy curve for the interaction of protons and neutrons assumed by Mamasachlisov in order to explain the absorption of slow neutrons also requires the existence of a considerable degree of anisotropy for the scattering of neutrons. This is contrary to experiment. Further, Mamasachlisov's theory requires a much greater cross-section of interaction than that calc. from the Wigner formula. (Cf. this vol., 109.)

H. C. G.

Transmutation of heavy elements. (LORD) RUTHERFORD (Proc. Roy. Inst., 1937, 29, 630—635).—A lecture.

Artificial radioactivity. II. K. DIEBNER and E. GRASSMANN (Physikal. Z., 1937, 38, 406—425; cf. A., 1936, 773).—The results of work on the production of radioactive nuclei by the action of α -rays, protons, deuterons, neutrons, electrons, and γ -rays are summarised. The possible types of nuclear reaction giving rise to radioactive nuclei are considered.

A. J. M.

Materialisation of the energy of the β -rays from thorium-B + C. M. MONADJÉMI (Compt. rend., 1937, 204, 1560—1562).—The no. of positrons produced by bombardment of Al screens by β -rays from Th-B + C increases with increasing screen thickness up to 0.023 g. per sq. cm., and then decreases, becoming zero at about 0.13 g. per sq. cm. Cellophane and Cu screens of equal wt. give similar yields of positrons.

J. W. S.

γ -Rays emitted on disruption of ${}^7\text{Be}$ with α -particles. S. PRANCHETTI (Nuovo Cim., 1935, [ii], 12, 516—521; Chem. Zentr., 1935, i, 3264).—The excitation curve for γ -rays is determined, using bombarding α -rays of various energies, and agrees with that of the neutrons. It is considered that

γ -radiation is emitted from the ${}^{12}\text{C}$ resulting from the disintegration.

J. S. A.

γ -Rays from lithium bombarded with protons. A. I. ALICHANIAN (Physikal. Z. Sovietunion, 1937, 11, 462—464).—The electron pairs observed by Crane and Gaertner (cf. this vol., 108) must have been largely produced by internal conversion. The difference in the behaviour of the γ -quanta 14.5 and 17.5 m.e.v. with regard to the formation of pairs and the Compton effect can therefore be explained without the hypothesis of Crane (*ibid.*, 119).

O. D. S.

Instability of ${}^5\text{He}$. J. H. WILLIAMS, W. G. SHEPHERD, and R. O. HAXBY (Physical Rev., 1937, [ii], 51, 888—889).—No.-range distribution curves of α -particles resulting from the reaction ${}^7\text{Li} + {}^3\text{H} \rightarrow {}^4\text{He} + {}^2\text{He} + n$ show the existence of a homogeneous group superimposed on the background of this reaction and interpreted as due to α -particles from ${}^7\text{Li} + {}^3\text{H} \rightarrow {}^4\text{He} + {}^4\text{He}$. It is possible that ${}^5\text{He}$ exists only long enough to give ${}^4\text{He}$ a definite energy before it disintegrates into ${}^4\text{He}$ and a neutron.

N. M. B.

Reported radioactivity of ${}^{38}\text{A}$. D. ROAF (Proc. Roy. Soc., 1937, A, 159, 133—137).—There is no evidence that A atoms formed by the disintegration of radio-Cl are radioactive.

G. D. P.

Formation of radio-aluminium (${}^{28}\text{Al}$) and the resonance effect of ${}^{25}\text{Mg}$. W. Y. CHANG and A. SZALAY (Proc. Roy. Soc., 1937, A, 159, 72—82).—The formation of radio-Al from ${}^{25}\text{Mg}$ by bombardment of α -particles of different energies is investigated. Resonance levels are found. It is suggested that the potential barrier of a nucleus does not exhibit resonance levels and that the max. in proton or neutron yield are due to changes of transition probabilities.

G. D. P.

Radioactivity due to neutron ejection produced by fast neutrons. M. L. POOL, J. M. CORK, and R. L. THORNTON (Physical Rev., 1937, [ii], 51, 890).—Using a cyclotron, 6.3 m.e.v. deuterons bombarded Li, B, Be, and Cu, and the radiation from these activated in turn N, O, Ag, and Cu shielded from the deuteron beam. The secondary targets were activated differently than by deuterons or slow neutrons directly; ordinary half-life periods are lacking or suppressed and a new radiopositive period appears, agreeing with ejection of neutrons from the nuclei by the exciting radiation. Experiments indicate that most, if not all, of the activation of the secondary targets is due to fast neutrons. The max. neutron energies from Li, B, and Be were 14, 13, and 4.6 m.e.v., respectively. The isotopes formed are ${}^{63}\text{Cu} \rightarrow {}^{62}\text{Cu}$, ${}^{65}\text{Cu} \rightarrow {}^{64}\text{Cu}$, ${}^{107}\text{Ag} \rightarrow {}^{106}\text{Ag}$, and ${}^{109}\text{Ag} \rightarrow {}^{108}\text{Ag}$.

N. M. B.

Production of radioactive elements by bombardment of lithium and magnesium with α -rays from thorium-C'. A. ECKARDT (Ann. Physik, 1937, [v], 29, 497—513).—No activity could be induced in Li by bombardment with 8 cm. α -rays from Th-C' for 10 mm. Conditions were suitable for the production of ${}^{10}\text{Be}$ and ${}^7\text{B}$. Mass determinations indicate that the former is probably a stable nucleus. With Mg the possible nuclei were ${}^{27}\text{Si}$, ${}^{28}\text{Al}$, and ${}^{29}\text{Al}$.

The first two were detected and have half-life 7.6 and 2.2 min., respectively. A. J. M.

Radioactivity produced by γ -rays and neutrons of high energy. W. Y. CHANG, M. GOLDBERGER, and R. SAGANE (*Nature*, 1937, **139**, 962—963).—The radioactive isotopes of O, Cu, Ga, Br, Ag, In, and Sb, the production of which can be ascribed only to the loss and not to the capture of neutrons, are tabulated. The loss of neutrons was effected by irradiation with γ -rays from Li + protons and with neutrons from Li + deuterons and B + deuterons. The 13 min. half-period obtained with Sb is probably due to ^{120}Sb and not to ^{122}Sb . In Ga bombarded with neutrons from Li + deuterons and B + deuterons a new radioactivity of approx. 5 min. half-period has been found in addition to that of the 60 min. period. The new reaction is probably $^{69}\text{Ga} + {}^1_0\text{n} \rightarrow {}^{66}\text{Cu} + {}^3_2\text{He}$. With neutrons of Li + deuterons or B + deuterons, but not with those of Be + deuterons or with slow neutrons, a short-period activity, 8 sec., was found to be due to O, accounted for by the reaction $^{16}\text{O} + {}^1_0\text{n} \rightarrow {}^{15}\text{N} + {}^1_1\text{H}$. L. S. T.

Induced radioactivity of silver with neutrons from slow deuterons. E. BERTL, R. FURTH, F. ONORIL, and K. SITTE (*Nature*, 1937, **139**, 964—965).—The neutrons formed when Be-coated mica is bombarded with 25-kv. deuterons (this vol., 340) are due to the reaction ${}^9\text{Be} + {}^1_1\text{H} \rightarrow {}^{10}\text{B} + {}^1_0\text{n}$. A curve showing the no. of neutrons produced by deuterons of energies up to 35 kv., measured by the no. of Ag atoms transmuted, is given. L. S. T.

Energy-range relations for cosmic-ray particles. P. M. S. BLACKETT (*Proc. Roy. Soc.*, 1937, **A**, 159, 19—31).—An absorption curve over the range from sea level down to an equiv. depth of 1500 m. of H_2O is compiled from a no. of sources. Comparison with the measured energy spectrum gives the energy-range curve. Between $E = 0$ and $E = 3 \times 10^9$ e.v. the energy loss is 2—3 times that due to ionisation; between $E = 3 \times 10^9$ and $E = 10^{10}$ e.v. the energy loss is but little > the ionisation loss, whilst at higher energies the loss again increases to > 3 times the ionisation loss. The excess energy loss is attributed to radiation emission and shower formation.

G. D. P.

Further measurements of the cosmic-ray energy spectrum. P. M. S. BLACKETT (*Proc. Roy. Soc.*, 1937, **A**, 159, 1—18).—With improved methods the energy of 829 cosmic-ray tracks in a field of 12,000—14,000 gauss has been measured. The sp. curvature (σ) spectrum of positive and negative rays is similar, being fairly const. between $\sigma = \pm 0.4$, when it drops suddenly. Corresponding with the curvature spectrum, the energy spectrum shows anomalies near 2.5×10^9 e.v. The spectra are interpreted as being the absorption of cosmic rays in air. The evidence for the existence of protons in the main beam is collected and the question of the existence of negative protons discussed. G. D. P.

Study of cosmic-ray particles of high energy in the magnetic field of the Bellevue electromagnet. L. LEPRINCE-RINGUET and J. CRUSSARD (*J. Phys. Radium*, 1937, [vii], **8**, 207—212).—The trajectories

of the particles comprising the high-energy portion of cosmic rays ($1-20 \times 10^9$ e.v.) in the magnetic field (13,000 gauss) of the large electromagnet of the Academie des Sciences have been studied. Positively and negatively charged particles were found to enter the Wilson chamber in approx. equal nos. The ultra-penetrating radiation (capable of penetrating 14 cm. of Pb) consists predominantly of positively charged particles. More than a quarter of the ultra-penetrating rays were not deviated by the field, and in many cases had energy $> 20 \times 10^9$ e.v. The radiation passing through 14 cm. of Pb contains a considerably smaller no. of uncharged particles. Secondary trajectories of particles of considerable energy, and showers, were also observed. A. J. M.

Nature of cosmic-ray particles. S. H. NEDDERMEYER and C. D. ANDERSON (*Physical Rev.*, 1937, [ii], **51**, 884—886).—Investigations of the energy loss of cosmic rays in Pt support the view of the existence of both penetrating and non-penetrating particles (cf. *ibid.*, 1936, [ii], **50**, 263). These may be less massive than protons, but more penetrating than electrons.

N. M. B.

Connexion between cosmic rays and meteoric swarms. J. ZIRKLER (*Naturwiss.*, 1937, **25**, 367).—The study of Th- C'' - γ curves with a specially sensitive apparatus shows the probability of a connexion between cosmic rays and meteoric swarms.

A. J. M.

Latitude effect of ultra-radiation. B. GROSS (*Z. Physik*, 1937, **105**, 334—340).—The hypothesis that the latitude effect at submarine levels is produced by an almost homogeneous radiation component is discussed mathematically. L. G. G.

Structure of cosmic ultra-radiation. III. B. TRUMPY (*Z. Physik*, 1937, **105**, 341—347; cf. *A.*, 1936, 1315).—The absorption curves for C electrons were obtained by means of two coincidence counters, used singly and together, under a Pb plate 12 mm. thick. Analysis of the curves does not support the conclusion that B -radiation showers are produced in the plate. Comparison of curves from two and three counters respectively show that small amounts of coinciding B quanta arise under the Pb plate. The quantity of C electrons released from coinciding light quanta in the absorbing medium is a max. between 5 and 7 mm. thickness of Pb. L. G. G.

Showers produced by the soft group of cosmic rays. P. AUGER and P. EHRENFEST, jun. (*J. Phys. Radium*, 1937, [vii], **8**, 204—206).—The showers produced by the soft fraction of cosmic rays were studied at an altitude of 3500 ft. Observations of cascades of showers lead to the conclusion that the soft fraction of cosmic rays consists of electrons (both positive and negative), and a non-ionising part consisting of photons. It is probable that the cosmic rays of the lower atm. are not primary, but secondary, being parts of showers produced in the upper atm. by the primary radiation. A. J. M.

Recent progress in the neutrino theory. I. J. SOLOMON (*J. Phys. Radium*, 1937, [vii], **8**, 179—184).—The recent theoretical work on the neutrino is discussed with a view of overcoming some of its

difficulties. The theory of β -disintegration is considered. A. J. M.

Recent theories of light. L. DE BROGLIE (Ann. Soc. Sci. Bruxelles, 1937, 57, B, 99—119).—An exposition and discussion of the photon theory and of Jordan's neutrino theory. N. M. B.

Magnetic moment of the proton. B. G. LASAREV and L. V. SCHUBNIKOV (Physikal. Z. Sovietunion, 1937, 11, 445—457; cf. this vol., 121).—The magnetic moment of the proton deduced from measurements of the magnetic susceptibility of H_2 at 1.76° and 2.18° abs. is 2.7 nuclear magnetons with error <10%. O. D. S.

Inelastic collision of deuteron and deuteron. L. I. SCHIFF (Physical Rev., 1937, [ii], 51, 783—788).—Certain symmetry properties of the reactions are developed to obtain an expression for the angular distribution of the reaction products. Results are in qual. agreement with available experimental data. N. M. B.

Energetic stability of isobaric nuclei. G. J. Sizoo (Physica, 1937, 4, 467—472).—Mathematical. F. J. L.

Neutron-proton interactions. J. H. BARTLETT, jun. (Physical Rev., 1937, [ii], 51, 889).—Available data and theory are discussed in relation to the assumption of a rectangular potential well. N. M. B.

Virial theorem. E. L. HILL (Physikal. Z. Sovietunion, 1937, 11, 458—461).—A reply to Hellmann (cf. this vol., 124). O. D. S.

Convergence of the Hylleraas variational method. A. S. COOLIDGE and H. M. JAMES (Physical Rev., 1937, [ii], 51, 855—859; cf. Bartlett, *ibid.*, 1935, [ii], 47, 697).—Mathematical. The Hylleraas method is justified, from consideration of the wave-equation for He. N. M. B.

Criteria of goodness for approximate wave functions. H. M. JAMES and A. S. COOLIDGE (Physical Rev., 1937, [ii], 51, 860—863).—Mathematical. N. M. B.

Plain atomic and molecular models in quantum chemistry. J. B. RUMER (Trav. Congr. Jubil. Mendeleev, 1936, 1, 161—172).—A lecture. J. W. S.

Atomic nucleus and periodic system of the elements. L. MEITNER (Trav. Congr. Jubil. Mendeleev, 1936, 1, 173—184).—A lecture. The various methods of producing artificial nuclear transformations are discussed. J. W. S.

Chemical elements and fundamental material; Mendeleev's view and the modern concept. F. PANETH (Trav. Congr. Jubil. Mendeleev, 1936, 1, 115—130).—The development of the conceptions of units of at. structure is traced. J. W. S.

Periodic law viewed from the basis of spectral analysis. D. ROSHDESTVENSKI (Trav. Congr. Jubil. Mendeleev, 1936, 1, 87—112).—A lecture. The relationships between at. spectra, the electronic states in the atom, and the periodic law are traced in detail. J. W. S.

Nuclear forces. K. NAKABAYASHI (Sci. Rep. Tôhoku, 1937, 25, 1141—1161).—Mathematical. F. J. L.

Density of energy levels of heavy nuclei. J. BARDEEN (Physical Rev., 1937, [ii], 51, 799—803).—Mathematical. Assuming that the particles move in a simple potential hole, calculations are based on the Van Vleck statistical model. Results do not agree with those of Bethe (cf. A., 1936, 1175). N. M. B.

Nuclear two-, three-, and four-body problems. W. RARITA and R. D. PRESENT (Physical Rev., 1937, [ii], 51, 788—798).—Mathematical. N. M. B.

Measurement of the Bohr magneton. O. STERN (Physical Rev., 1937, [ii], 51, 852—854).—A mol.-ray method for the measurement of forces acting on mols., the forces being compensated by the force of gravity (mol. balance), is discussed. N. M. B.

Precision determination of e/m for electrons. A. E. SHAW (Physical Rev., 1937, [ii], 51, 887).—Using a new focussing method for electrons in superimposed electric and magnetic fields, the val. obtained is $(1.7571 \pm 0.0013) \times 10^7$ e.m.u. (cf. *ibid.*, 58). N. M. B.

Work of the electromagnetic field in the dynamic theory of Röntgen interference and according to quantum mechanics. F. GALPERIN (Physikal. Z. Sovietunion, 1937, 11, 182—193).—The work of the electromagnetic field in any given element of the crystal lattice space during one oscillation is zero by the interference theory of Laue and others, but not by quantum mechanics. A. E. M.

Long-wave extensions in the ultra-violet absorption of alkali halide crystals. E. REXER (Z. Physik, 1937, 106, 70—92).—The influence of optical irradiation, mechanical deformation, and heat-treatment of KBr crystals on the intensity of the sharply defined absorption has been examined. L. G. G.

Absorption spectra of the alkali halides and their constituents in solution. A. K. DUTTA (Trans. Bose Res. Inst. Calcutta, 1934—1935, 10, 209—221).—Regions of absorption in the ultra-violet and corresponding energies are tabulated; in most cases two regions were found. The longer- λ region of the chlorides is interpreted as the electron affinity spectrum of the H_2O mol., and the shorter- λ region as an electron affinity spectrum of the halogens. The electron affinity of H_2O , calc. by Pauling's relation using the long- λ limit, is for Cl' 105, Br' 106, and I' 106 kg.-cal. The longer- λ region of the bromides and iodides is attributed, supported by electrolytic dissociation theory, to the breaking up of undissociated mols. in the solution. N. M. B.

Origin and mobility of colour centres in alkali halide crystals. H. ROGNER (Ann. Physik, 1937, [v], 29, 386—393).—The equilibrium concn. of colour centres in KCl and KBr crystals has been measured in an atm. of K vapour at a series of temp. and pressures. The no. of centres per c.c. \propto no. of K atoms per c.c. of vapour. The proportionality factor is >1 and decreases with rising temp. The mobility of centres in KCl crystals at 670° is independent of

their concn. At temp. $<550^\circ$ the mobility decreases with increasing concn. O. D. S.

Band fluorescence of alkali crystals containing oxygen and carbon monoxide. W. HONRATH (Ann. Physik, 1937, [v], 29, 421—432).—Easily decomp. crystals containing O, e.g., those of CO_3'' , OH' , NO_3' , NO_2' , as well as crystals saturated by heating under O_2 pressure, show the fluorescence observed by von Lüpke (A., 1934, 1286). The spectrum differs only slightly for KCl, KBr, and KI, and consists of a no. of equidistant bands with a separation of 0.12 e.v. The phosphorescence observed in crystals containing U-centres by Roos (A., 1934, 1155) can be produced by heating crystals in CO and K vapour simultaneously. O. D. S.

Absorption spectra of zinc and cadmium halides in the vapour state. S. DEB (Trans. Bose Res. Inst. Calcutta, 1934—1935, 10, 223—240).—Data for the visible and ultra-violet regions at different temp. and v.p. are reported. The vapours absorb continuously from a long- λ limit, resulting in photochemical decomp. into the normal state in accordance with the general equation for heteropolar mols.: $\text{MX}_2 + h\nu = \text{M} + 2\text{X}$, $h\nu$ corresponding with the thermochemical binding energy of the mols. Heats of dissociation are calc. from heats of formation and latent heats of vaporisation and are compared with the corresponding vals. of the beginnings of absorption and interpreted. Other observed absorption regions with energy $<$ the thermochemical binding energy are interpreted as due to a single electron transition in the normal mol. $\text{M}^{++}\text{X}''$; hence the binding energy of the temporary mol. MX is calc. N. M. B.

New absorption system of cyanogen gas in the near ultra-violet system. S. C. Woo and T. K. Liu (J. Chem. Physics, 1937, 5, 499).—Corrections to a previous paper (this vol., 215). W. R. A.

SiBr bands. E. MIESCHER (Helv. phys. Acta, 1935, 8, 587—588; Chem. Zentr., 1936, i, 3269).—The electrodeless discharge excites a series of strong bands between 3240 and 2870 Å. J. S. A.

The λ 2708 and 2756 bands of OD. M. ISHAQ (Proc. Roy. Soc., 1937, A, 159, 110—122).—The bands are similar to those of OH at λ 2608 and 2677. The vals. of the rotational const. are determined, and a list of wave nos. is given. G. D. P.

Rotational analysis of the "3A" bands of carbon monoxide. R. SCHMID and L. GERO (Nature, 1937, 139, 928).—The structure of the so-called "3A" bands of CO in the region 2200—2600 Å., obtained by means of a high-intensity discharge between C electrodes in Ne gas, is described. L. S. T.

Absorption spectrum of liquid nitric oxide. B. VODAR (Compt. rend., 1937, 204, 1467—1469).—By using the method previously described for N_2O (this vol., 342), the absorption of liquid NO in the visible and ultra-violet has been investigated. At atm. pressure liquid NO exists between -163° and -150.2° . 2 cm. of NO gives a continuous spectrum with minimal absorption at 4600 Å. and independent of temp. between -155° and -147° . Liquid NO is light green, probably due to particles of solid N_2O_3 .

If NO is condensed on N_2O_4 at liquid air temp. no N_2O_3 is formed, but the NO is coloured green at the moment of fusion. W. R. A.

Band spectrum of MgO in ultra-violet. J. VERHAEGHE (Wis.- en nat. Tijdschr., 1935, 7, 224—233; Chem. Zentr., 1936, i, 3451).—Three band systems, with origins at 3720, 3766, and 3799 Å., are identified. J. S. A.

Influence of preliminary illumination and of temperature on the absorption of light by cuprous oxide. S. I. GOLOUB and G. A. KOULEV (Physikal. Z. Sovietunion, 1937, 11, 168—181).—The coeff. of absorption of different specimens of Cu_2O throughout the spectrum was increased by preliminary illumination with blue light, but reduced by similar treatment with red light. Rise of temp. up to 140° gave increased coeff. of absorption in the region of 6000 Å. A. E. M.

Coloration of zircon by irradiation. J. LIETZ (Naturwiss., 1937, 25, 415—416).—Spectrophotometric determinations of the absorption of specimens of zircon showing coloration due to oxidation, reduction, and exposure to light and radioactive radiations have been carried out. The colours produced by oxidation at high temp. and irradiation with ultra-violet light are similar but distinct. Chemical coloration is usually irregularly distributed through the crystal, whilst that due to irradiation is uniformly distributed, is independent of previous chemical treatment, and resembles the coloration produced in the alkali halides. Three narrow absorption bands corresponding with 2.62, 1.90, and 3.4 e.v., respectively, were observed. During irradiation, zircon emits a fluorescence radiation of 2.5—2.6 e.v. Heating to 120° changes the colour from greenish-black to red. At 250° the crystal is colourless. A. J. M.

Spectrum of praseodymium oxide in the vapour state. G. PICCARDI (Atti R. Accad. Lincei, 1936, [vi], 23, 358—361; cf. A., 1929, 1207).— $\lambda\lambda$ and relative intensities of the bands in the visible region are tabulated. O. J. W.

Colour and constitution of bivalent cobalt compounds. W. FEITKNECHT (Helv. Chim. Acta, 1937, 20, 659—682).—A review of present knowledge and theories. C. R. H.

Relation between configuration of metallic complex salts and their absorption spectra. H. SUEDA (Bull. Chem. Soc. Japan, 1937, 12, 188—198; cf. this vol., 241).—A comparison of the absorption curves of various nitrito-cobaltamine salts in the neighbourhood of λ 360 m μ indicates that the absorption is expressible as the sum of the absorptions due to certain structural elements into which the complex may be resolved. Differences between observed and calc. vals. of the extinction coeff. are due partly to the adoption of a simplifying assumption and partly to errors of measurement. A *trans* configuration is assigned to $\text{K}[\text{Co}(\text{NH}_3)_2(\text{NO}_2)_4]$ (Erdmann's salt). The application of the principle to chloro-aquo-ammine salts of Co and Cr is discussed. F. L. U.

Energy states in solids with particular reference to $\text{NdCl}_3 \cdot 6\text{H}_2\text{O}$. F. H. SPEDDING and H. F.

HAMLIN (J. Chem. Physics, 1937, 5, 429—442).—Absorption spectra of $\text{NdCl}_3 \cdot 6\text{H}_2\text{O}$ have been photographed over a wide temp. range and two new low-lying states were found. These arise presumably from a splitting of the basic state in a predominantly cubic field. The over-all and relative splitting are rather different from the vals. found for the sulphate because of the change in the crystal field brought about by the break in the homologous series of the hydrated chlorides of the rare earths between Nd and Pr. W. R. A.

Electronic transitions in Nd^{+++} ions and the absorption spectra in solution and crystals. P. C. MUKHERJI (Indian J. Physics, 1937, 11, 123—141).—The absorption spectra of Nd^{+++} ions (900—200 $\text{m}\mu$) have been classified, using solutions at room temp. and large single crystals of various thicknesses at liquid air temp. The existence of a lower excited level, 249 cm^{-1} above the basic level, at low temp. is indicated. F. J. L.

Energy states of crystalline $\text{Pr}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$. F. H. SPEDDING, J. P. HOWE, and W. H. KELLER (J. Chem. Physics, 1937, 5, 416—429).—Absorption spectra of both crystals and conglomerates of $\text{Pr}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ have been photographed over a wide range of temp. Three new low-lying excited levels exist besides the basic state and their vals. are in fair agreement with calc. vals. of Penney and Schlapp (A., 1932, 985) and with vals. calc. from the field const. D for rare-earth sulphates. The spectra are complicated by coupling of the highly excited states with vibrational states. W. R. A.

Ultra-violet absorption spectrum of potassium pererrhenate. J. F. H. CUSTERS (Physica, 1937, 4, 426—429).—A strong band λ 2290 Å. and a weak one 2390 Å. are observed in the absorption spectrum of KReO_4 , corresponding with bands at λ 5465 and 5660 Å. in the absorption spectrum of KMnO_4 . F. J. L.

Influence of solvent on the absorption spectrum of neodymium acetylacetonate. M. RADOITCHITCH (Compt. rend., 1937, 204, 1469—1470).—The spectrum of Nd acetylacetonate in 40 different solvents has been investigated. Solvent influences exert an effect on the bands either by regular displacement in position without change in the structure of the band and without deformation, or an irregular displacement accompanied by change in the structure of the band system. Solvation may account for some of the effects, but the influence of the solvent cannot be explained entirely on the basis of its dielectric const. or dipole moment. W. R. A.

Ionic association and absorption spectra. H. VON HALBAN and B. SZIGETI (Helv. Chim. Acta, 1937, 20, 746—761).—The absorption spectra of picrates in solvents of low dielectric const. and in conc. aq. solutions of inorg. halides have been investigated. The spectra of undissociated picrate differs only slightly from the spectra of picrate ions in H_2O . The nature of the cation has a slight effect compared with the difference between the spectra of dissociated and undissociated picric acid. Halides have little effect on the spectra of the picrate ion in H_2O . The

data are compared with the results of other workers and are discussed. C. R. H.

Variation with temperature of ultra-violet absorption spectra of acetone and iodine in solution. H. J. WALLS and E. B. LUDLAM (Trans. Faraday Soc., 1937, 33, 776—781).—The absorption max. of COME_2 dissolved in H_2O , MeOH, and C_6H_{14} are displaced towards longer λ with rise of temp., whilst those of I in EtOH are displaced in the opposite sense. The temp. coeff. of the displacement for COME_2 increases with rise of temp. in all solvents, and the displacement itself is much less for H_2O than for the other solvents. The effects are discussed. F. L. U.

Absorption spectra and dissociation energies of normal and *iso*-thiocyanates. S. C. WOO and T. C. CHU (J. Chinese Chem. Soc., 1937, 4, 162—169).—The ultra-violet absorption spectra of the vapours and solutions in MeOH consist of two continua which merge at high concn. The long $\lambda\lambda$ of the first continua correspond with the dissociation energies (kg.-cal. per mol.): MeSCN <108.1, EtSCN <108.5, MeNCS <94.5, EtNCS <99.4, $\text{C}_3\text{H}_5\text{NCS}$ <100.8, PhNCS <98.0. A few diffuse bands due to the C_6H_5 ring were observed in the first continuum of PhNCS vapour. The mechanism of photodecomp. is discussed. J. G. A. G.

Absorption spectra and dissociation energies of cyanic acid and some isocyanates. S. C. WOO and T. K. LIU (J. Chem. Physics, 1937, 5, 499).—Corrections to an earlier paper (cf. A., 1935, 1299). W. R. A.

Continuous absorption spectra of some polyatomic molecules. Y. HUKUMOTO (Sci. Rep. Tohoku, 1937, 25, 1162—1169).—The absorption spectra of MeSH, EtSH, PrSH, BuSH, $\text{CH}_3\text{Ph}\cdot\text{OH}$, CH_2PhBr , CH_2PhCl , $\text{CH}_2\text{Ph}\cdot\text{CN}$, $\text{CH}_2\text{X}\cdot\text{CH}_2\cdot\text{OH}$ (X = Cl, I, CN); $\text{CCl}_2\text{Me}\cdot\text{OH}$; $\text{Ph}\cdot[\text{CH}_2]_n\cdot\text{OH}$ ($n = 2, 3$), and some miscellaneous alcohols, in gaseous and liquid phase, have been measured, and the dissociation energy is estimated from the absorption edge. F. J. L.

Absorption spectra of strychnine and its derivatives.—See A, II, 312.

Light absorption of systems. II. Spectra of ergosterol, vitamin- D_2 , Δ^8 -decadiene, cholesterol, and isoprene. H. MOHLER (Helv. Chim. Acta, 1937, 20, 811—816).—The spectra are compared with those of other unsaturated compounds with reference to the arrangement of the double linkings. C. R. H.

Transmission of oxides in the far infra-red. M. PARODI (Compt. rend., 1937, 204, 1636—1638).—Absorption in the far infra-red has been studied with MnO , SrO , CdO , BaO , and CuO , bands occurring at 33, 47, 51.5, 53, and 31 and 38 μ , respectively. λ for the band is a parabolic function of the at. no. of the metal, including MgO and CaO . Compressibilities have been calc. and agree with experimental vals. R. S. B.

Infra-red absorption spectra of [eight aliphatic] alcohols, [formic and acetic] acids, and their solutions in carbon tetrachloride. E. L. KINSEY

and J. W. ELLIS (J. Chem. Physics, 1937, 5, 399—405; cf. A., 1936, 268).—The absorptions of the pure liquids in the regions 0.9 to 2.2 and 2.0 to 4.0 μ are compared with their absorptions in CCl_4 solution (1 vol. in 19 vols. of CCl_4); data for the vapours of MeOH, EtOH, HCO_2H , and AcOH are also given. Bands characteristic of the OH group are modified in solution, but bands characteristic of the hydrocarbon chain remain unaltered. In solution, polymerisation or lattice structure effects are apparently destroyed, since bands attributable to single mols. are found in solution with much greater intensity than in the pure liquid. These bands in solution are accompanied on the long-wave side by a broad region of continuous absorption attributable to polymerised mols., and this region becomes more intense as the concn. of solute increases, until in the pure liquid it predominates. Comparison is made with the spectrum of NH_2Ph , which displays peculiar behaviour near 1.4 μ . W. R. A.

Infra-red absorption spectra and ethylenic compounds. III. $\beta\gamma$ -Ethylenic acids and γ -lactones. R. DELABY and J. LECOMTE. **IV. Types of molecular vibration.** J. LECOMTE and R. DELABY (Bull. Soc. chim., 1937, [v], 4, 1007—1016, 1016—1024).—III. Acids of the general formula $\text{R}\cdot\text{CH}\cdot\text{CH}\cdot\text{CH}_2\cdot\text{CO}_2\text{H}$ ($\text{R} = \text{Et}, \text{Pr}^a, \text{Bu}^a, \text{Bu}^b, n\text{-C}_5\text{H}_{11}, \text{and } n\text{-C}_7\text{H}_{15}$) were obtained by hydrolysis of the corresponding nitriles by means of $N\text{-NaOH}$ or conc. aq. $\text{Ba}(\text{OH})_2$ at 90—95°. After extraction with Et_2O the extracts were neutralised with HCl, steam-distilled, and the distillates re-extracted with Et_2O . After drying, the Et_2O was removed and the acids were distilled under reduced pressure. In this way the conversion of the $\beta\gamma$ -nitrile into the $\alpha\beta$ -acid was prevented. γ -Lactones with $\text{R} = \text{Me}, \text{Et}, \text{Pr}^a, \text{Bu}^a, \text{Bu}^b, n\text{-C}_5\text{H}_{11}, n\text{-C}_6\text{H}_{13}, n\text{-C}_7\text{H}_{15}, n\text{-C}_9\text{H}_{19}, n\text{-C}_{12}\text{H}_{25}, \text{and } \text{Pr}^b\cdot[\text{CH}_2]_n\cdot\text{CHMe}$ were prepared from the nitriles by boiling with 50 vol.-% H_2SO_4 and extracting with Et_2O , and distilling under reduced pressure. Compared with the saturated acids, the introduction of the $\beta\gamma$ -C:C linking has little effect on the absorption bands due to the CO_2H , but the bands due to the saturated C chain are absent in the unsaturated acids. The bands attributed to the CO-O group in the lactones are compared with similar bands found in the case of aliphatic esters.

IV. The bands due to the C:C linking and the influence of substituents are discussed. C. R. H.

Infra-red absorption spectrum of keten. H. GERSHINOWITZ and E. B. WILSON, jun. (J. Chem. Physics, 1937, 5, 500).—The examination of gaseous keten with a rock-salt prism spectrometer between 740 and 3500 cm^{-1} has revealed bands agreeing roughly with the Raman lines for the liquid. No bands ascribable to COMe_2 , C_2H_4 , or CH_4 were found. Ketene has nine fundamentals active in both Raman and infra-red spectra. W. R. A.

Raman spectrum and the structure of water. P. C. CROSS, J. BURNHAM, and P. A. LEIGHTON (J. Amer. Chem. Soc., 1937, 59, 1134—1147).—Raman spectra of H_2O , ice, and D_2O have been determined. The relative amounts of the different co-ordination types of H_2O have been estimated. In

the range 25—90°, H_2O is slightly >2 -co-ordinated and slightly less co-ordinated than is D_2O . The 2-co-ordinated structures predominate in both liquids. In ice at 0° the 4-co-ordinated structure predominates, but appreciable amounts of 3- and 2-co-ordinated mols. are present. The energy of the H linking in H_2O is calc. as 3 kg.-cal. per mol. per linking. The agreement of the results with those of X-ray data is discussed. E. S. H.

Raman effect in circularly polarised light in quartz, observed along the optic axis. C. BOUHER (Compt. rend., 1937, 204, 1661—1663).—The Raman lines from quartz illuminated by circularly polarised light were found to be completely circularly polarised. Lines 207, 355, and 465 cm^{-1} had the same sense of rotation as the incident light, and lines 128, 394, 696, and 1161 cm^{-1} the opposite.

R. S. B.

Werner complexes. Raman spectra of complex ions of the type $[\text{MX}_3]$. J. P. MATHIEU (J. Phys. Radium, 1937, [vii], 8, 169—174).—The Raman spectra of the complexes $\text{Cl}_4[\text{Pt en}_3]$, $\text{Cl}_3[\text{Rh en}_3]$, $\text{Br}_3[\text{Ir en}_3]$, $\text{Cl}_2[\text{Zn en}_3]$, and $\text{Cl}_2[\text{Ni en}_3]$, [$\text{en} = (\text{CH}_2\cdot\text{NH}_2)_2$] have been studied, using Hg lines 4358 and 4047 Å. The lines are the sharper the more stable is the complex. The polarisation of the lines was studied for the Pt compound. A. J. M.

Raman effect of two complex molybdotartrates in water. (MLLE.) M. THEODORESCO (Compt. rend., 1937, 204, 1649—1651; cf. A., 1936, 1445).— $\text{Na}_2\text{MoO}_4\cdot 2\text{H}_2\text{O}$ (I) and $\text{Na}_2\text{WO}_4\cdot 2\text{H}_2\text{O}$ give similar Raman spectra and $\text{Na}_4[\text{t}_2\text{MoO}_3]$ (II) and $\text{Na}_2[\text{tMoO}_3]$ (III), where t = tartrate, differ from the corresponding W compounds in one line only, 924 cm^{-1} in (II) and 934 cm^{-1} in (III). The Raman spectra of (II) and (III) differ very slightly from the spectrum of (I), except for the line due to CO_2H , which becomes a band in the complex tartrates. R. S. B.

Interpretation of Raman spectra of alcohols and acetone by their changes on dissolution in them of metal perchlorates. J. GOUBEAU (Z. physikal. Chem., 1937, B, 36, 45—84; cf. A., 1933, 764).—The Raman spectra of solutions of perchlorates in MeOH, EtOH, Pr^aOH , Bu^aOH , COMe_2 , EtOAc, and Et_2O have been determined. In each solvent except MeOAc there is a frequency which is depressed by the solute, whilst the CH frequencies are in general increased. All three frequencies of the ClO_4^- ion are increased by the cation, but this effect is weakened by the solvent, and the more so the higher is the dielectric const. of the latter. The alcohols exhibit a line at approx. 1050 cm^{-1} , which is ascribed to oscillation of the C-O linking. Association depresses this frequency. It has been shown for ten aliphatic alcohols that the whole C chain oscillates relatively to the OH. Intermol. forces can be explained as the effect of dipoles and ions on the inductive power of the negative O atom. The inductive effect is large for an α -Me group, but decreases rapidly with increasing chain length and is scarcely perceptible with β -Me groups. R. C.

Raman spectra of some acid chlorides. V. N. THATTE and M. S. JOGLEKAR (Phil. Mag., 1937, [vii],

23, 1067—1078).—The Raman spectra of several acid chlorides are recorded. The characteristic frequency shift due to C=O linking is ~ 1790 and 1774 cm^{-1} in aliphatic and aromatic compounds, respectively; the mean shift due to C-Cl linking is 448 cm^{-1} .

F. J. L.

Raman effect of organic substances. VIII. Furan derivatives. K. MATSUNO and K. HAN (Bull. Chem. Soc. Japan, 1937, 12, 155—163; cf. A., 1934, 1155).—Raman spectra of Me and Et esters of α -furfuracrylic, *trans*-cinnamic, α -furylpropionic, and hydrocinnamic acids are given. The results indicate that the so-called stable furfuracrylates are *trans* esters.

F. L. U.

Raman spectra and molecular structure of ethane and its derivatives. S. MIZUSHIMA and Y. MORINO (J. Chem. Soc. Japan, 1935, 56, 1464—1470; cf. A., 1935, 281).—The data for mols. of the type $\text{CH}_3\text{X}\cdot\text{CH}_2\text{X}$ are best explained by assuming hindered rotation and not by *cis-trans* isomerism.

CH. ABS. (e)

Raman spectrum and molecular structure of benzene. S. MIZUSHIMA and Y. MORINO (J. Chem. Soc. Japan, 1935, 56, 1470—1474).—Hexagonal symmetry is more probable than trigonal. The modes of vibration of C_6Cl_6 and C_6Me_6 are calc.

CH. ABS. (e)

Scattering of light as a function of the relation of particle size to wave-length. N. FUKS (J. Phys. Chem. Russ., 1937, 9, 295—296).—Remarks on a paper by Gurevitch and Veitzer (this vol., 220).

E. R.

Chemiluminescence.—See A., III, 275.

Action of the electric field on photoluminescent compounds. Superluminescent and extinction effects. G. DESTRIAU (J. Chim. phys., 1937, 34, 327—332; cf. this vol., 283).—ZnS previously irradiated by violet or ultra-violet light or X-rays emits, even after several days if kept in the dark, a strong superluminescence of short duration followed by a faint superluminescence of long life when a const. or sinusoidal electric field is applied. If, however, irradiation with infra-red rays is interposed before the field is applied, the superluminescence is diminished or completely suppressed (cf. A., 1936, 1320). The electrons responsible for the superluminescence have relatively stable upper levels. The results are further discussed and anomalies are removed. J. G. A. G.

Quantum theory of the phosphorescence of crystal phosphors. II. T. MUTO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 5—25; cf. A., 1936, 270).—The quantum theory of phosphorescence is discussed and applied to crystals with small concns. of foreign ions, e.g., $\text{KCl}+\text{Tl}$ or Pb .

R. S. B.

Effect of pressure on phosphors. N. RIEHL and H. ORTMANN (Ann. Physik, 1937, [v], 29, 556—568).—The effect of pressure on phosphors has been examined in the case of ZnS and alkaline-earth sulphide phosphors. Powdering has no effect on the sp. gr. of the phosphors, and the abs. effect of pressure on the intensity of the emitted light was much overrated in the earlier work, largely because of the failure to take into account the diminution in transparency

of the phosphor produced by the powdering. A medium powdered phosphor showed 10%, and an extremely finely powdered one 36%, smaller intensity of emission than the unpowdered phosphor. An approx. calculation of the no. of centres which are brought to the surface by the powdering gives a result agreeing with the experimental determination of the decrease of intensity. The mechanical stability of a phosphorescence centre is as great as that of the normal lattice.

A. J. M.

Mercury arc rectifier studied by probe electrodes. T. HADA (J. Inst. Elect. Eng. Japan, 1935, 55, 965—973).—Data are recorded. Electrons have a Maxwellian velocity distribution, even at 600° near the cathode.

CH. ABS. (e)

Photo-electric measurements with antimony. V. MIDDEL (Z. Physik, 1937, 105, 358—377).—An inner photo-electric effect was found for cathode-sputtered Sb, the max. effect occurring at 3700 \AA . Measurements of the outer photo-electric effect gave a continuously increasing current with decreasing λ , and a long-wave limit between 3000 and 3100 \AA .

A. E. M.

Electrical equilibrium in systems of metallic conductors only, and permanent thermo-electric currents in complete metallic circuits. F. Odone (Nuovo Cim., 1935, [ii], 12, 522—530; Chem. Zentr., 1936, i, 3459).—Theoretical. The inner- and outer-Volta effect, Peltier effect, and Thomson effect are treated thermodynamically.

J. S. A.

Conduction of electricity in solids. N. F. MOTT (Nature, 1937, 139, 951—954).—A summary of three lectures.

L. S. T.

Electron conductivity and halogen excess in alkali halide crystals. E. MOLLWO (Ann. Physik, 1937, [v], 29, 394—406).—On heating KI and KBr crystals in I and Br, respectively, crystals are obtained which contain excess of halogen in concn. $C \propto$ the pressure of the gas. The proportionality factor is < 0.01 and increases with rise of temp. The absorption spectra of the crystals are described. The mobility v in electric fields of the excess of halogen is $<$ that of the colour centres and inversely $\propto C$. At const. C , v increases with rise of temp. The thermal diffusion const. of excess of halogen is $>$ that calc. from v . It is supposed that equilibrium exists in the crystal between halogen atoms and mols. and that the electrical conductivity is due to atoms. No excess of halogen was detected in KCl after heating in Cl_2 vapour.

O. D. S.

Variation in conductivity of thin film of sodium chloride and rock-salt crystal with temperature. H. SAEGUSA and T. MATSUMOTO (Sci. Rep. Tohoku, 1937, 25, 805—815).—The variation of conductivity (σ) with temp. (T) of artificial NaCl crystals satisfies $\log \sigma - B/A/T$, but natural rock-salt does not, probably because of impurities. Films of NaCl $5\text{--}10\text{ }\mu$ thick have high, irregular conductivity, which decreases to $1/10$ after heating to 160° and then obeys the above relation.

F. J. L.

Conductivity of solid dielectrics at high field strengths. F. QUITTNER (Physikal. Z. Sovietunion, 1937, 11, 359—368).—Theoretical. The increase in

conductivity at high field strengths is a true property of solid insulators and is probably produced in amorphous bodies by ions and in cryst. bodies by electrons. O. D. S.

Nature of the electrical conductivity of solid dielectrics in strong electric fields. II. Mica at high field strengths. V. PRUSCHININA-GRANOV-SKAJA (Physikal. Z. Sovietunion, 1937, 11, 369—389).—Conduction through mica at 30—60° in fields about 2×10^6 volts per cm. is not accompanied by electrolysis. At higher temp. (400°) and $2-5 \times 10^5$ volts per cm. Al and O₂ are liberated at the cathode and anode, respectively, but in quantities insufficient to account for the whole of the conductivity. Transport nos. of the ions vary with temp. It is deduced from the variation of electronic conductivity with field strength that at low temp. and weak fields conductivity is ionic. O. D. S.

Free intra-molecular rotation and dielectric loss in a high-frequency field. L. D'OR and J. HENRION (Physikal. Z., 1937, 38, 426).—If a mol. has a polar group capable of free rotation, of which the moment is inclined to the axis of rotation, it can orient itself in a high-frequency field in a different way from the rest of the mol. Since the relaxation time of the group is $<$ that of the whole mol. the orientation could be determined with waves of $1/\nu <$ relaxation time of the whole mol. and $>$ that of the group. If $1/\nu >$ relaxation time of the mol. it would be expected that the dielectric loss of such a mol. would be $<$ that for a mol. without internal free rotation. This has been verified by determining the dielectric loss for $\lambda = 7.2$ m. of *p*-C₆H₄(CH₂Cl)₂ (I) (a mol. with internal free rotation) and *o*-C₆H₄Cl₂ (without such free rotation). The dielectric loss of the latter was 2.6 times that of the former. The CH₂Cl groups of (I) must be chiefly responsible for the loss in this compound. A. J. M.

Theory of the measurement of dielectric constants and absorption coefficients in the region of short waves. V. I. ROMANOV (Physikal. Z. Sovietunion, 1937, 11, 404—413).—Expressions for the dielectric const. and the absorption of the dielectric filling the condenser are derived from the resonance curves for a system composed of a condenser in the circuit of a Lecher system. O. D. S.

Dipole moment and Raman effect of molecules with groups capable of free rotation. II. S. MIZUSHIMA, Y. MORINO, and M. KUBO (Physikal. Z., 1937, 38, 459—462; cf. A., 1935, 12).—The mol. structures of *s*-C₂H₄Cl₂, -C₂H₄ClBr, -C₂H₄Br₂, -C₂H₂Cl₄, and C₂Cl₆ are considered on the basis of their Raman spectra and dipole moments. In C₂Cl₆ the majority of the mols. have the *trans*-structure, and on account of the symmetry, only a few normal Raman lines are permitted, in agreement with experiment. The di-substitution products are most stable in the *trans*-form. The probability of deviation from this form varies with temp. and solvent. Tetra-substitution products (CHX₂·CHX₂) show a potential min. in addition to that of the *trans*-structure. The dipole moments of these products depend to a large degree on the solvent, but are little affected by temp. due

to displacement of the potential min. in the mol. field of the solvent. The structure of CH₂(OMe)₂, in which there is intramol. rotation about two axes, is considered. In this compound there is intramol. rotation about a stable position in which the two Me groups lie on opposite sides of the O·C·O plane. CH₂(OEt)₂ and CHMe(OEt)₂ have similar structures to CH₂(OMe)₂. The dipole moment of CO(OEt)₂ is independent of temp. (80—204°). A. J. M.

Theory of effect of magnetic field on dielectric constant of diamagnetic gases and liquids. I—III. A. PIEKARA (Acta phys. polon., 1935, 4, 53—64, 73—77, 163—175; Chem. Zentr., 1936, i, 3456—3457).—An approx. quant. theory is developed on classical lines. The effect cannot be ascribed to mol. orientation or to intermol. forces, but may be due to the induction of a weak electric moment by strong magnetic fields. The effect is correlated with the superposed magnetic and electrical double refractive effects. J. S. A.

Dielectric constants of gases and vapours. VIII. Dipole moments of some organic compounds containing a double linking. M. KUBO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 26—32; cf. this vol., 65).—From measurements of ϵ on the vapours of allyl chloride (I) at 307.8—480° abs. and cyclohexene (II) at 307.5—480.4° the dipole moments have been calc. to be 1.88×10^{-18} and 0.61×10^{-18} , respectively. Electric polarisation for (I) and (II) is 18.65 and 26.5 c.c., and at. polarisation for (I) is 1.8 c.c. On the assumption that the mean state of (I) is near the *trans*-position, it is inferred that in unsaturated hydrocarbons the double linking contributes to the mol. a small electric moment, the negative end of which lies at the part of the mol. containing the double linking. R. S. B.

Raman effect and dipole moment in relation to free rotation. VII. Quantum mechanical resonance in carboxylic acids. Y. MORINO and S. MIZUSHIMA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 33—43).—The Raman spectra of HCO₂H and saturated HCO₂Na have been observed. For HCO₂' the symmetric vibrations are 2822, 1354, and 766 cm.⁻¹, and the force consts. $k_{CO} = 9.29 \times 10^5$ and $k_{CH} = 4.27 \times 10^5$ dynes per cm. The ions HCO₂' and CO₃'' are compared. The change in Raman spectrum on passing from HCO₂' to HCO₂H is discussed in terms of a resonance structure for CO₂H, and the possibility of the existence of a rigid form

R-C $\begin{smallmatrix} \diagup \\ \diagdown \end{smallmatrix}$ O differing considerably in energy from the H normal form is inferred (cf. this vol., 345). R. S. B.

Dielectric constant and dipole moment of ethyl maleate and fumarate and their ozonides. E. BRUNER, E. PERROTTET, H. PAILLARD, and B. SUSZ (Helv. Chim. Acta, 1937, 20, 762—767).—With CCl₄ as solvent, the following vals. for dielectric const., ϵ , and dipole moment ($\times 10^{18}$), respectively, have been obtained at 23°. Et maleate (I), 8.58, 2.51; Et fumarate (II), 6.56, 2.23; ozonide of (I), 8.95, 2.53; ozonide of (II), 7.54, 2.29. The vals. of ϵ for pure ozonides are considered to be $<$ those of the ozonides

examined on account of the presence in the latter of decomp. products, *e.g.*, H_2O , acids, which have a high ϵ .
C. R. H.

Dielectric constant and molecular size. Rubber compounds. II. Duprene and rubber hydrochloride. N. J. J. LI (J. Chinese Chem. Soc., 1937, 5, 117—123).—The dielectric consts. of solutions of duprene, $(\text{CH}_2\text{CClCH}(\text{CH}_2)_n)$ (I), and rubber hydrochloride (II) in C_6H_6 , CHCl_3 , and CCl_4 are independent of λ ($16.6\text{--}3 \times 10^5$ m.). The non-polarity of (I) and (II) is discussed. J. G. A. G.

Dielectric properties of Japanese lacquer film. A. MIYATA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 357—369).—Films of Japanese lacquer 0.1 mm. thick were formed on oxidised Al by successive bakings. The dielectric strength was $2.5\text{--}4 \times 10^5$ volts per cm. and ϵ was 3.6 at 20° ; ϵ increased slightly with rise of temp.
R. S. B.

Atomic refractivities of amide-nitrogen. K. VON AUWERS (Z. physikal. Chem., 1937, 179, 61—64).—Despite the recognition of the amides in the liquid and dissolved states as tautomeric mixtures (A., 1937, II., 281) the vals. hitherto recognised for the at. refractivities of amide-N are still valid.
R. C.

Rotatory dispersion of isohydrobenzoin and dipole moments of isohydrobenzoin and benzoin. F. EISENLOHR and L. HILL (Z. physikal. Chem., 1937, B, 36, 30—44).—The dispersion curves in the visible of *d*- and *l*-isohydrobenzoin at $20\text{--}50^\circ$ show no signs of anomalous rotatory dispersion. The dipole moments of the *l*-, racemic, and meso-forms are 2.70 , 2.72 , and 2.48×10^{-18} , e.s.u., respectively.
R. C.

Theory of optical rotatory power. J. G. KIRKWOOD (J. Chem. Physics, 1937, 5, 479—491).—Mathematical. A simplified treatment of Born's quantum-mechanical theory of optical activity gives a simple expression for the rotatory parameter of an active mol. in terms of the geometrical configuration and the polarisability tensors of its constituent groups. The rotatory power depends on the optical anisotropy of component groups and on inhibited internal rotation. The abs. configuration and sp. rotation of *d*-sec.-BuOH are calc.
W. R. A.

Magnetic rotatory power of compressed and liquefied nitric oxide. H. BIZETTE and B. TSAI (Compt. rend., 1937, 204, 1638—1640).—The magnetic rotatory power (ρ) of NO has been determined at 19° to -80° at pressure $44.5\text{--}142$ kg. per sq. cm., and $\lambda = 0.546 \mu$. It is calc. that ρ passes through a max. at -138° . There is indication of polymerisation of NO at -80° under pressure. Verdet's const. at -104° and pressure 68.5 kg. per sq. cm. for $\lambda = 0.546 \mu$ is -3.684×10^{-2} , and the % of $(\text{NO})_n = 21$.
R. S. B.

Structure of diborane. S. H. BAUER (J. Amer. Chem. Soc., 1937, 59, 1096—1103).—Electron-diffraction investigation indicates a C_2H_6 -like structure with the B—B distance $1.86\text{--}0.04$ Å. and the B—H distance $1.27\text{--}0.03$ Å. The valency angles of B are tetrahedral within 3° . A compatible electron configuration is described in terms of the at. and mol. orbital models. The stability of B_2H_6 in comparison

with BH_3 is due to the resonance energy made available through the full use of the four orbitals of B.
E. S. H.

Constitution of some halogen compounds of rhodium. J. MEYER, M. KAWCZYK, and K. HOEHNE (Z. anorg. Chem., 1937, 232, 410—414).— $\text{RhX}_3 \cdot 2\text{C}_2\text{H}_5(\text{NH}_2)_2(\text{HX})_2$ ($\text{X} = \text{Cl}, \text{Br}$) and $\text{RhBr}_3 \cdot 2\text{C}_2\text{H}_5(\text{NH}_2)_2(\text{HBr})_2$ have four ionisable halogen atoms and $2\text{RhBr}_3 \cdot 3\text{NH}_2\text{Me} \cdot \text{HBr}$ has three. They are double salts in which RhX_3 is non-ionisable.
F. J. G.

Periodic system of chemical compounds of the type A_mB_n . H. G. GRIMM (Trav. Congr. Jubil. Mendeleev, 1936, 1, 355—368).—A lecture. Binary compounds are classified and electron configurations leading to each type of compound are deduced.
J. W. S.

Internal sphere of complex compounds. I. TSCHERNIAEV (Trav. Congr. Jubil. Mendeleev, 1936, 1, 461—465).—A lecture. The mechanism of the binding forces in co-ordination compounds is discussed.
J. W. S.

Physical chemistry of complex compounds. A. GRUNBERG (Trav. Congr. Jubil. Mendeleev, 1936, 1, 479—492).—A summary of recent work on complex Pt salts.
J. W. S.

Magnetic anisotropy and electronic structure of aromatic molecules. K. LONSDALE (Proc. Roy. Soc., 1937, A, 159, 149—161).—The anisotropy of C_6H_6 , cyanuric, and phthalocyanine compounds is explained by supposing that π electrons occupy plane orbits which are free to precess only in their own plane. Valency (*s*) electrons behave as if they are spherically symmetrical and free to precess under the influence of any magnetic field. The radii of orbits calc. from susceptibility data agree with the theory of mol. orbitals, 0.7 Å. for *s* electrons and 1.55 Å. for C_6H_6 π electrons.
G. D. P.

Potential function of the water molecule. G. W. KING (J. Chem. Physics, 1937, 5, 405—412).—A method, in which it is assumed that the potential function of the H_2O mol. is unaltered on isotopic substitution, is advanced for evaluating the force consts. in the general quadratic expression for the energy, and on the basis of this method a valency angle of $107^\circ 22'$ is obtained in agreement with the val. derived from rotational analysis. Using this val. the potential function is determined by taking into account all the possible modes of at. interaction.
W. R. A.

Anharmonicity constants of the potential function of the water molecule. G. W. KING (J. Chem. Physics, 1937, 5, 413—415; cf. preceding abstract).—Mathematical. Matrix mechanics have been used to calculate the true vibrational levels of a triat. mol. and its isotopic varieties. The calculations have been applied to the zero-point frequencies of H_2O and D_2O .
W. R. A.

Fundamental frequencies of CH_4 , CHD , CD_2 , CHCl , CDCl , and *cis*- and *trans*- $\text{C}_2\text{H}_2\text{D}_2$ and $-\text{C}_2\text{H}_2\text{Cl}_2$. T. Y. WU (J. Chem. Physics, 1937, 5, 392—398).—The groups CH_2 , CHD , CD_2 , CHCl , CDCl have been treated as a valence force system, and the relative dependence of the three fundamental

frequencies calc. for each group on the val. of the deformation frequency is utilised in assigning the individual modes of vibration of the group. The calculation is used to assign the calc. frequencies of *cis*-, *trans*-, and *as*-C₂H₂D₂ (cf. Manneback and Verleysen, A., 1936, 1324). Recorded data on the polarisation and intensities of Raman lines, infra-red absorption measurements, and application of selection rules are considered for *cis*- and *trans*-C₂H₂Cl₂ and a suggested assignment is made. W. R. A.

Thermodynamic functions for molecules having restricted internal rotations. K. S. PITZER (J. Chem. Physics, 1937, 5, 469—472).—A theoretical method is given for determining the rotational contribution to the thermodynamic functions of a mol. from a consideration of the potential barriers hindering rotation about the various linkings within the mol. W. R. A.

Thermodynamics of gaseous hydrocarbons: ethane, ethylene, propane, propylene, *n*-butane, Δ^{α} -butene, *cis*- and *trans*- Δ^{β} -butene, isobutene, and neopentane (tetramethylmethane). K. S. PITZER (J. Chem. Physics, 1937, 5, 473—479; cf. preceding abstract).—A reformulation is given of the statistical methods of calculation of the thermodynamics of gaseous hydrocarbons which take into account the contributions due to restricted rotation about C-C linkings. Although assumptions regarding the height and shape of the potential barriers restricting rotation are necessary, it is possible to obtain vals. in agreement with experimental results. The mol. structure data thus obtained, together with available heats of combustion and of hydrogenation, have been employed in calculations which yield thermodynamic consts. and the free energy of formation as a function of the temp. between 300° and 1500° abs. W. R. A.

Valency angles and binding strength of the carbon atom. T. FÖRSTER (Naturwiss., 1937, 25, 366—367).—The variation in strain on passing from the five- through the four- to the three-membered ring in *cyclo*-aliphatic hydrocarbons results in an increase in the binding frequency of CH in the Raman spectrum, and an increase of the frequency of the "pulsation vibration" of the ring, but not to the extent required if the force consts. of the C-C linkings remain unchanged. The force consts. of the linkings in the ring must become smaller, resulting in a similar change in the binding strength. This conclusion can also be derived from quantum-mechanical considerations. Even greater deviations are observed in the case of rings containing C'C and C-C. A. J. M.

Vibrations of asymmetrical collinear triatomic molecules. (Miss) J. E. ROSENTHAL (J. Chem. Physics, 1937, 5, 465—466).—Expressions are given for asymmetrical collinear mols. of the types X₂Y and XYZ and are applied to calculating the frequencies of N₂¹⁸O employing an approx. potential function. The ratio of the partition functions for N₂¹⁸O and N₂¹⁶O and the val. of the equilibrium const. of the reaction N₂¹⁶O + H₂¹⁸O \rightleftharpoons N₂¹⁸O + H₂¹⁶O have been found. W. R. A.

Calculation of the frequencies and modes of vibration of the monodeuteroethylene molecule.

G. LEMAITRE, C. MANNEBACK, and Y. L. TCHANG (Ann. Soc. Sci. Bruxelles, 1937, 57, B, 120—128; cf. A., 1936, 142, 1324).—The calc. and observed frequencies of C₂H₃D are in satisfactory agreement. Vibration diagrams are given and angles relative to the C-C axis are tabulated. The distribution of potential energy for the four types of symmetry is given for each mode of vibration. N. M. B.

Normal vibrations and the vibrational spectrum of C₂H₆. J. B. HOWARD (J. Chem. Physics, 1937, 5, 442—450).—Mathematical. The vibrations, frequencies, and selection rules of C₂H₆ are discussed. Raman and infra-red spectra are satisfactorily accounted for on the basis of the point group D_{3h}. W. R. A.

Rotation-vibration spectrum of C₂H₆ and the question of free internal rotation. J. B. HOWARD (J. Chem. Physics, 1937, 5, 451—459).—Mathematical. Consideration of the infra-red bands of C₂H₆ suggests strongly the presence of a potential of ≤ 2000 g.-cal. restricting internal rotation. W. R. A.

Transitions in condensed systems. O. K. RICE (J. Chem. Physics, 1937, 5, 492—499).—A method based on the thermodynamic relation $(\partial E/\partial V)_T - T(\partial S/\partial V)_T$ is presented for studying transitions in condensed phases. It is shown that as the temp. is raised from 0° abs. there must be at least one transition, whilst other transitions may occur due to the setting in of mol. rotations. The method has been applied to N₂ and O₂ for which data are available. The equation of Eyring and Hirschfelder (this vol., 224) relating $V(\partial S/\partial V)_T$ and V does not agree well with experimental data, especially for substances of low b.p. W. R. A.

Lattice energy of potassium bromide and sodium bromide and the electron affinity of bromine. A. N. TANDON (Indian J. Physics, 1937, 11, 99—107).—The lattice energies of KBr and NaBr determined from thermal ionisation (1400—1650°) are 159 and 176.3 kg.-cal.; the electron affinity of Br is 80 kg.-cal. F. J. L.

Electronic lattice of the transition elements. R. FÖRSTER (Compt. rend., 1937, 204, 1554—1556; cf. A., 1935, 1305).—The law found previously, $T - F\sqrt{N}$, holds for the transition elements if it is assumed that F , the intensity of interaction between the electronic orbits, \propto their orbital quantum nos. The lattice valency of these elements is equal to the no. of d electrons with non-compensated spin. J. W. S.

Theory of movement of two electrically charged particles. F. J. WIŚNIEWSKI (Acta phys. polon., 1935, 3, 329—341; Chem. Zentr., 1936, i, 3263).—A theory is developed whereby particles of like charge exert a mutual repulsion at large distances, but an attractive effect at very small distances. J. S. A.

Elementary expression of the energy affecting a magnetic particle of very small dimensions in a magnetic field. A. GUILBERT (Compt. rend., 1937, 204, 1463—1465).—Mathematical. W. R. A.

Generalisation of aerodynamic and electrodynamic fundamental equations. N. P. KASTERIN (Acad. Sci. U.S.S.R., 1937, 16 pp.).—Mathematical. N. M. B.

Tentative statistical theory of Macleod's equation for surface tension, and the parachor. R. H. FOWLER (Proc. Roy. Soc., 1937, A, 159, 229—246).—A theoretical derivation of Macleod's equation from very general assumptions. The val. of the parachor can be computed in terms of known at. consts. for liquids in which the structure is known. Applied to Hg and A fair agreement with experiment is obtained. G. D. P.

X-Ray determination of lattice constants and axial ratios of crystals belonging to the oblique systems. M. J. BUEGER (Amer. Min., 1937, 22, 416—435).—A discussion. L. S. T.

Quantitative determination of lattice disturbance from Debye-Scherrer photographs. R. BRILL (Z. Physik, 1937, 105, 378—388).—A method is described whereby the mean amplitude of vibration of atoms in a crystal lattice may be determined from intensity measurements of Debye-Scherrer photographs. A series of measurements with specimens of Fe prepared by decomp. of the carbonyl and subsequently heat-treated in H_2 at various temp. is reported. H. C. G.

Precision determination of lattice constants by the compensation method. H. VAN BERGEN (Naturwiss., 1937, 25, 415).—The lattice const., a , 3607.53 ± 0.04 Å, of Cu was obtained for the (420) and (240) Cu $K\alpha$ reflexions by the compensation method of Kossel (A., 1936, 925). A. J. M.

X-Ray scattering in liquids. B. S. DŽELEPOV (Physikal. Z. Sovietunion, 1937, 11, 157—167).—Apparatus described incorporates a 40-kv. Coolidge tube with Mo anti-cathode, and NaCl diffraction for X-ray diffraction of org. liquids contained in an Al vessel with walls 10 μ thick. Measurement (with $K\alpha_1$ and $K\alpha_2$ radiation) is made over a small angle range with an ionisation chamber filled with EtBr vapour. The method allows observations to be made during transient physical phenomena in the examined liquid. Intensity curves for C_6H_6 , MeOH, EtOH, and polymerised styrene are given. L. G. G.

Space chemistry of solid materials. W. BILTZ (Trav. Congr. Jubil. Mendeleev, 1936, 1, 197—212).—A lecture. Regularities in mol. vols. in binary and quaternary glasses, homologous series, isomorphous series, etc. are discussed in relation to crystal structure. J. W. S.

Atomic and ionic radius in crystals. A. K. BOLDYREV (Trav. Congr. Jubil. Mendeleev, 1936, 1, 293—354).—A lecture. The theory of ionic radius and its application to problems of crystallography are summarised. J. W. S.

Intensities of X-ray reflexions from single crystals of sodium between 120° and 370° abs. R. H. V. M. DAWTON (Proc. Physical Soc., 1937, 49, 294—306).—Intensity-temp. curves show strong hysteresis which vanishes when the crystals are suddenly chilled by liquid air, but not for slow annealing.

EE (A., I.)

At. scattering curves are given, the normal temp. effect is measured with the chilled crystals, and the characteristic temp. is calc. from the Debye-Waller formula. N. M. B.

Size of nuclei in solid metal reactions. G. DERGE (J. Chem. Physics, 1937, 5, 462—464).—The Tamman concept of crystals requires the formation of crystal nuclei and their subsequent growth. An upper limit to the no. of atoms required for formation of such nuclei can be obtained from consideration of existing data, obtained by geometric matching and orientation relationships, for several solid metal reactions. A stable nucleus may contain as few as 10 atoms and certainly >100 . W. R. A.

Powder patterns on ferromagnetic crystals. K. J. SIXTUS (Physical Rev., 1937, [ii], 51, 870—877).—Patterns reported by Bitter (cf. A., 1932, 1077) were studied on large 3.5% Si-Fe crystals. Three types of patterns were observed at low, medium, and high fields, respectively. The direction of I and II is determined by the crystal orientation, and that of III is always nearly normal to the applied field. The characteristics of the types are: I is found only in polished or strained annealed crystals, II is formed at the intersections of magnetic "sheets," lying in dodecahedral (110) planes, with the surface, and III is formed near surface inhomogeneities. N. M. B.

Structural changes during the growth of metal films. A. G. QUARRELL (Proc. Physical Soc., 1937, 49, 279—293).—Extra rings in electron-diffraction patterns for thin films of face-centred cubic metals prepared by evaporation, electrodeposition, chemical deposition, and chemical displacement are due to the fact that the first deposited layers crystallise in close-packed hexagonal crystals having an axial ratio c/a 1.63, the effective at. radius being the same as in the normal face-centred cubic form. A gradual transition from close-packed hexagonal to face-centred cubic is postulated, and the prominent band is attributed to the progressive contraction of the (100) hexagonal to the (200) cubic spacing during the transition. Certain very thin evaporated films yield intermediate structures, indicating a gradual transition as deposition proceeds, and not one due to at. rearrangement at crit. film thickness. These views are supported by the discovery of an electrodeposited solely close-packed hexagonal Ag film, a similar Au film yielding a pattern of equally pronounced hexagonal and cubic diffractions, and evaporated Co films, mainly hexagonal with a certain amount of the face-centred cubic form. N. M. B.

Orientation of crystals in silicon-iron. R. M. BOZORTH (Trans. Amer. Soc. Met., 1935, 23, 1107—1111).—The component crystals are oriented with a [001] direction parallel to the direction of rolling and a (110) plane in the rolling plane. CH. ABS. (e)

Crystal structures of Ni_2Al_3 and $NiAl_3$. A. J. BRADLEY and A. TAYLOR (Phil. Mag., 1937, [vii], 23, 1049—1067).— Ni_2Al_3 is trigonal, space-group D_{3d}^3 ($C3m$), a 4.0282, c 4.8906 Å. The Al atoms lie at the corners of deformed cubes, $\frac{2}{3}$ of which contain Ni atoms nearly at the centre. $NiAl_3$ is orthorhombic, space-group ($Pnma$), a 6.5982, b 7.3515,

c 4.8021 Å. 4 Ni and 4 Al atoms form distorted hexagons lying in the reflexion planes, and the remaining 8 Al atoms are in general positions. The Al—Ni distance is 2.42—2.49 Å. and Al—Al 2.86 Å.

F. J. L.

Crystal structure of solid hydrogen sulphide. S. C. SIRKAR and J. GUPTA (Indian J. Physics, 1937, 11, 119—121).—The H—S—H angle in solid H_2S is approx. 109° , and S—H is 2.5 Å. The S atoms are arranged in a face-centred cubic lattice and the H occupy the same positions as the F in CaF_2 . Space-group O_h^4 .

F. J. L.

Structure of liquid hydrogen peroxide. J. T. RANDALL (Proc. Roy. Soc., 1937, A, 159, 83—92).—An X-ray investigation shows that the liquid is essentially a close-packed cubic structure. The structure proposed by Penney and Sutherland (A., 1934, 1158) is confirmed and the dipole moment calc. from the structure is in good agreement with the experimental val.

G. D. P.

Crystal structure of low-temperature quartz. F. MACHATSCHKI (Fortschr. Min., 1936, 20, 45—47; Chem. Zentr., 1936, i, 3480).—Low-temp. quartz has a co-ordination lattice with Si—O distances 1.58 and 1.64, O—O tetrahedron edges 2.54 and 2.69 Å., Si—Si 3.05 Å. The Si—O—Si angle is 142° . The structure of $AlAsO_4$ and $AlPO_4$ is discussed.

J. S. A.

Structures of silica glass, puzzuolanas, and clays by means of electron diffraction. N. A. SCHISCHAKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 17, 127—130).— SiO_2 glass, puzzuolanas, and clays give similar sharp rings on electron diffraction photographs, characteristic of two-dimensional crystallites. Owing possibly to decomp. produced by the beam, the clays give reflexion from only the Si_2O_5 sheets, which are the main constituents of the puzzuolana. Extra rings in the glasses and puzzuolanas may be due to an additional phase of two-dimensional crystallites aggregated to a cristobalite-like structure.

R. S. B.

Oxidation of iron and cementite and some properties of iron oxides. K. ENDO (Sci. Rep. Tōhoku, 1937, 25, 879—920).—The oxidation and magnetisation of Fe, Fe_3C , Fe_2O_3 , and FeO on heating and cooling have been examined. Fe_2O_3 shows a magnetic transformation at 1030° unaccompanied by change in crystal structure. Fe_3O_4 belongs to the spinel type of structure (the unit cell containing 4 mols. of surplus O), changing to Al_2O_3 type at 600° . Limonite belongs to Al_2O_3 type above 350° .

F. J. L.

Orientation of α -iron crystals obtained by reduction of Fe_3O_4 . L. N. KATZAUROV (J. Phys. Chem. Russ., 1937, 9, 292—293).—X-Ray diagrams of α -Fe obtained by reduction of Fe_3O_4 by H_2 reveal a texture inherited from the Fe_3O_4 crystals.

E. R.

Surface magnetisation and block structure of ferrite. W. C. ELMORE and L. W. MCKEEHAN (Amer. Inst. Min. Met. Eng., Inst. Met. Div., 1935, Tech. Publ. 656, 15 pp.; cf. A., 1936, 275).—A block model composed of cubes with an edge of 0.5—3.0 μ , and magnetised along the [100] or [110] axes, is

proposed. Segregation of foreign atoms may account for the stability of the block boundaries.

CH. ABS. (e)

Relation between fine structure of crystal surfaces and structure of reaction layers formed on them. P. A. THIESSEN and H. SCHUTZA (Z. anorg. Chem., 1937, 233, 35—40).—The 100, 111, and 110 surfaces of Cu single crystals were oxidised in air at 325° and 150 mm., and the structures of the Cu_2O layers determined by X-ray or electron-diffraction patterns. The 111 and 110 planes of Cu_2O grow parallel to the corresponding planes of Cu, but the 111 plane of Cu_2O grows on the 100 plane of Cu. The orientation of the oxide layer is such that the surface density of Cu atoms is most nearly the same as in the underlying metal surface.

F. J. G.

Zirconium dioxide. X-Ray diffraction studies. G. L. CLARK and D. H. REYNOLDS (Ind. Eng. Chem., 1937, 29, 711—715; cf. A., 1925, i, 149; 1930, 1099).—Zirconyl hydroxide, pptd. from a hot solution of $ZrOCl_2 \cdot H_2O$ with NH_3 , and dried at 110° , remained amorphous after heating for 12 hr. at 300° , but at 500° developed the tetragonal form, and retained it after long heating at this temp., but slowly transformed into the monoclinic form at 600° . The low-temp. tetragonal form appears to be identical with that stable at $>1000^\circ$; its inversion temp. (to the monoclinic form) can be raised to $>1000^\circ$ by admixture with SiO_2 , with which it appears to form a solid solution.

R. C. M.

Crystal structure of bornite, Cu_5FeS_4 . D. LUNDQVIST and A. WESTGREN (Arkiv Kemi, Min., Geol., 1937, 12, B, No. 23, 6 pp.).—From powder photographs the formula is probably Cu_5FeS_4 , and the structure face-centred cubic, with a_0 10.93 Å., 80 atoms in cell. If the S atoms are in cubic close-packing, the Cu may be arranged statistically at random (cf. various high-temp. modifications of sulphides), or even inside the S octahedra.

B. W. R.

Structure of silver azide, AgN_3 . C. D. WEST (Z. Krist., 1937, 95, 421—425).—The cell is orthorhombic pseudo-tetragonal, space-group probably V^{29} . a_0 5.90, b_0 5.58, c_0 5.96 Å. At. parameters and distances are determined and compared with those from the structure of KN_3 . Confirmation is found that the N_3 ion is linear symmetrical.

B. W. R.

Structure of cadmium azide. M. BASSIERE (Compt. rend., 1937, 204, 1573—1574).— CdN_6 crystals about 1 mm. long can be obtained by mixing aq. $Cd(NO_3)_2$ (1 mol.) with aq. NaN_3 (2 mols.) and evaporating the filtered mixture in a vac. over H_2SO_4 . The yellowish-white orthorhombic crystals have a 7.82 ± 0.02 , b 6.46 ± 0.03 , c 16.04 ± 0.08 Å.; 8 mols. in unit cell, $d_{111} = 3.20 \pm 0.04$ ($d_{111}^{29} = 3.24$). The crystals so prepared frequently explode spontaneously or on friction.

J. W. S.

Crystal structure of silver nitrite. J. A. A. KETELAAR (Z. Krist., 1937, 95, 383—393).—The cell is rhombic with a_0 3.50, b_0 6.14, c_0 5.16 Å., 2 mols. in cell. Ag and O are located unequivocally; probable locations of the N are given, in the space-group C_{2h}^{20} . The structure is analogous to that of $NaNO_2$.

B. W. R.

Crystal structure of sodium metaborate, NaBO_2 . S. FANG (J. Amer. Ceram. Soc., 1937, 20, 214).—The previous data by Cole *et al.* (A., 1935, 434) are claimed to be incorrect. The true vals. are $d\ 2.464 \pm 0.005$, a rhombohedral cell containing 6 mols., $a\ 7.22 \pm 0.02\ \text{\AA}$, $\alpha\ 111^\circ 30'$, space-group D_{3d} .
J. A. S.

Correction in specific gravity and unit cell size of $\text{Na}_2\text{O} \cdot \text{B}_2\text{O}_3$. S. S. COLE, S. R. SCHOLLES, and C. R. AMBERG (J. Amer. Ceram. Soc., 1937, 20, 215).—Incorrect data were reported previously (A., 1935, 434) owing to the sample having become hydrated during the d determination. The correct data are $d\ 2.462 \pm 0.002$, $a_0\ 11.90$, $c_0\ 6.54\ \text{\AA}$, $c/a = 0.55$, 9 mols. to the cell.
J. A. S.

Crystal structure of zinc bromate hexahydrate, $\text{Zn}(\text{BrO}_3)_2 \cdot 6\text{H}_2\text{O}$. S. H. YU and C. A. BEEVERS (Z. Krist., 1937, 95, 426—434).—The space-group is $Pa3$, and a_0 is $10.316\ \text{\AA}$. The structure is found in detail, and a Fourier analysis of projected electron density is made. To show the lighter atoms, the effects of the diffraction rings of the heavy Br and Zn are eliminated by calculation. The structure of the H_2O bonds is in agreement with previous work.
B. W. R.

Structure of the triple nitrites. M. VAN DRIEL and H. J. VERWEEL (Z. Krist., 1937, 95, 308—314).—These compounds are $A_3M(\text{NO}_2)_6$ or $A_2BM(\text{NO}_2)_6$, where A is K, NH_4 , Rb, Tl, or Cs, B is Ca, Sr, etc., and M is Co, Rh, or Ir in the first and Fe^+ , Co^+ , Ni^+ , or Cu^+ in the second formula. From powder measurements on the K_3Co , $(\text{NH}_4)_3\text{Co}$, K_2CaNi , and K_2PbCu members, a new structure is suggested, space-group $Fm3$. Parameters and at. distances are given, and the solubilities are discussed.
B. W. R.

Crystal structure of compounds of the rare earths with the metalloids of the fifth group. Phosphides of lanthanum, cerium, and praseodymium. I. A. IANDELLI and E. BOTTI (Atti R. Accad. Lincei, 1936, [vi], 24, 459—464).— LaP , CeP , and PrP have been prepared by heating the corresponding elements together in sealed evacuated tubes. At 400 — 500° vigorous reaction takes place. X-Ray measurements show that the three phosphides probably have a NaCl lattice. The radius of the P^{3-} ion is calc. to be $1.77\ \text{\AA}$.
O. J. W.

So-called "hollow canals" in calcspar. P. J. HOLMQUIST (Arkiv Kemi, Min., Geol., 1937, 12, A, No. 10, 16 pp.).—A survey of the literature of these "canals" and other lamination phenomena is made; possible faults due to sliding over intersecting planes are discussed, and illustrated by photomicrographs of an actual crystal, in which the "canals" seem to be neither hollow nor bounded by plane surfaces.
B. W. R.

Structure of caesium nitrate. C. FINBAK and O. HASSEL (J. Chem. Physics, 1937, 5, 460—461).—X-Ray investigation and optical examination of crystals in polarised light verify the cubic nature of CsNO_3 between the transition point (161°) and the m.p. Single crystals are not destroyed by heating to $>$ the transition temp. and subsequent cooling. The Cs^+ ion lattice in the high-temp. modification is

cubic and in the low-temp. variety is pseudo-cubic, with approx. equal lattice constns. Possible space-groups are discussed and CsNO_3 appears to belong to the ditrigonal-pyramidal class with space-group C_{3v} .
W. R. A.

Powder and rotation photographs of chiolite. H. CLAUSEN (Z. Krist., 1937, 95, 394—403).—This substance has a tetragonal cell, $a_0\ 9.90$, $c_0\ 10.39\ \text{\AA}$. The formula is $\text{Na}_5\text{Al}_3\text{F}_{14}$. The space-group is not uniquely determined.
B. W. R.

Possibility of distinguishing right- and left-handed structures in crystals by means of their Laue patterns. J. TER BERG and F. M. JAEGER (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 406—410).—The conditions under which right- and left-handed structures may be distinguished are stated. It is shown that $d\text{-(CoX}_3)_2\text{Cl}_3 \cdot 4\text{H}_2\text{O}$, $d\text{-(CrX}_3)_2\text{Cl}_3 \cdot 3\text{H}_2\text{O}$, and $d\text{-(RhX}_3)_2\text{Cl}_3 \cdot 3\text{H}_2\text{O}$, where X is *l*-cyclohexane-*trans*-1 : 2-diamine, have analogous crystal structures.
O. D. S.

Crystallography of cupric saccharinate. H. A. KLASSENS and P. TERPSTRA (Rec. trav. chim., 1937, 56, 673—677).—Crystals of $(\text{C}_6\text{H}_4\text{C}_{\text{SO}}\text{N})_2\text{Cu} \cdot 6\text{H}_2\text{O}$, $d\ 1.809$, have axial ratios $a : b : c = 0.513 : 1 : 0.448$ and $\beta\ 78^\circ 46'$. X-Ray data give $a\ 8.4$, $b\ 16.3$, $c\ 7.37\ \text{\AA}$, space-group C_{2v} .
C. R. H.

Determination of the atomic parameters in anthraquinone crystals. B. C. GUHA (Nature, 1937, 139, 969).—The C skeleton has a plane structure with true hexagons and C—C distance the same as that in anthracene. The two O are inclined unsymmetrically to the C plane.
L. S. T.

Crystal structure of condensed ring compounds. V. Three isomeric dibenzcarbazoles. J. IBALL (Z. Krist., 1937, 95, 282—295).—3 : 4 : 5 : 6-Dibenzcarbazole is orthorhombic, space-group probably $A2_22$, $a_0\ 14.07$, $b_0\ 6.10$, $c_0\ 15.36\ \text{\AA}$. 1 : 2 : 7 : 8-Dibenzcarbazole cryst. from amyl acetate is orthorhombic, probable space-group $F222$, $a_0\ 10.27$, $b_0\ 10.26$, $c_0\ 50.5\ \text{\AA}$; cryst. from C_6H_6 it is monoclinic, probable space-group $P2_1/m$, $a_0\ 14.63$, $b_0\ 7.64$, $c_0\ 12.08\ \text{\AA}$, $\beta\ 96.0^\circ$. 1 : 2 : 5 : 6-Dibenzcarbazole is orthorhombic, probable space-group $Pbca$, $a_0\ 31.10$, $b_0\ 9.65$, $c_0\ 26.61\ \text{\AA}$. From observed intensities of reflexion and optical data suggestions are made for the mol. orientation.
B. W. R.

Electron diffraction and surface structure. G. I. FINCH (Proc. Roy. Inst., 1937, 29, 601—606).—A lecture.

Structure and formation of thin films studied by electron diffraction. G. I. FINCH and S. FORDHAM (Chem. and Ind., 1937, 632—639).—A summary, with references to published work in this field, together with some unpublished results of the authors.

Oxidation of a crystal surface studied by cathode-ray reflexion. T. YAMAGUCHI (Proc. Phys.-Math. Soc. Japan, 1935, 17, 443—453).—The ZnO produced is a single crystal with its (103) plane resting on the cleaved (110) surface of ZnS . The [010] axis of ZnO is parallel to the [110] axis of ZnS .
CH. ABS. (e)

Electron diffraction study of the graphitisation of some industrial lamp-blacks. A. BARONI (Atti R. Accad. Lincei, 1936, [vi], 24, 456—458).—Examination of various lamp-blacks, which had been heated to 700°, 1050°, and 1600° in an inert atm., by electron diffraction showed the graphite structure only in the samples which had been heated to 1600°.

O. J. W.

Production of electron-optical structure images with photo-electrons. H. GROSS and G. SEITZ (Z. Physik, 1937, 105, 734—737).—Ba is evaporated on to the metallic surface under examination, thus rendering it photo-electrically sensitive. Photo-electrons emitted are then focussed to an electron-optical image which shows the detail of the cryst. surface.

H. C. G.

Measurement of piezo-electric effects in crystalline powders. J. ENGL and I. P. LEVENTER (Ann. Physik, 1937, [v], 29, 369—385; cf. A., 1936, 582).—The position of resonance for quartz crystals varies with the crystal size in accordance with theory.

O. D. S.

Abnormally high magnetic permeability of nickel wire obtained by surface treatment. T. F. WALL (Nature, 1937, 139, 928).—When heated to 1150° in H₂ a pure Ni wire 0.125 in. diameter gave a max. val. of the permeability when cold of 2100 after approx. 7 hr. When electroplated with Cu to a thickness of approx. 0.003 in. and heated to 1030° in H₂ the max. permeability when cold became 3250. After demagnetisation from an induction density of 5150 gauss the coercive val. was 0.24 oersted and the remanent density 1270 gauss.

L. S. T.

Analysis of the processes of technical magnetisation. II. Significance of the interaction between elementary regions in regard to the technical magnetisation curve, especially when macroscopic flaws are present. K. H. R. WEBER (Z. Physik, 1937, 105, 676—697).

H. C. G.

Change of saturation magnetisation with uniform pressure. H. EBERT and A. KUSSMANN (Physikal. Z., 1937, 38, 437—445).—The effect of uniform pressure on the saturation magnetisation of Fe and Ni, and alloys of Fe with Ni, Co, Cr, Pt, of Ni with Al, Cr, Co, Cu, Mn, of Pt with Mn, and the ternary system Fe-Co-Cr was investigated. For the metals and most of the alloys the effect of pressure was small, the coeff. being 0.1—0.01% per 1000 kg. per sq. cm. Some of the alloys showed a considerable effect over certain composition ranges. Such alloys were always Fe alloys with a face-centred lattice, the added component being itself either ferromagnetic (Ni) or capable of forming ferromagnetic phases (Pt, Cr). The composition range is in the neighbourhood of the $\alpha \rightarrow \gamma$ transition line.

A. J. M.

Magnetic properties of natural and artificial iron-oxygen compounds. II. Change of magnetic properties of ferric hydroxides by heating in different gaseous atmospheres. L. KRAEBER and W. LUYKEN (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 149—162; cf. A., 1936, 46).—The change in magnetic properties of different specimens of Fe(OH)₃ on heating at 200—900° in N₂ or CO₂ is variable; in CO all the specimens give a product of max.

susceptibility when heated at 500°. Fe(OH)₃ is readily transformed into ferromagnetic γ -Fe₂O₃, but Fe₂O₃ which has been heated at high temp. does not undergo this transformation.

E. S. H.

Quasi-stationary field distribution in large Barkhausen discontinuities, and their indication by the ordinary Barkhausen effect. S. KOCH (Avh. norsk. Vid.-Akad. Oslo, Mat.-nat. Kl., 1935, No. 7, 3—40; Chem. Zentr., 1936, i, 3461—3462).—Accepted views are modified on the basis of measurements on Ni and Fe-Ni wires.

J. S. A.

Optics of thin metal films. H. WOLTER (Z. Physik, 1937, 105, 269—308).—Relations are developed which show the dependence of transmitted and reflected intensities on the optical consts. and thickness of metal films. The results confirm Maxwell's theory and provide means for determining optical consts. and the thickness of metal films from intensity measurements. Available measurements are in good agreement with calc. vals.

A. E. M.

Dispersion and absorption of lithium fluoride and sodium fluoride in the infra-red. H. W. HOHL (Ann. Physik, 1937, [v], 29, 433—448).—The refractive indices of cryst. LiF from 0.55 to 15.8 μ and from 39 to 55 μ , of cryst. NaF from 0.55 to 24 μ and from 48 to 55 μ , and of cryst. KCl and NaCl from 23 to 29 μ , the absorption consts. of LiF from 4.5 to 15.8 and of NaF from 7.5 to 24 μ , and the reflecting powers of LiF and NaF to 55 μ are tabulated.

O. D. S.

The α - β transformation of quartz. H. E. von STEINWEHR (Naturwiss., 1937, 25, 348).—The α - β transformation of quartz has been studied by photographing simultaneously the variation of double refraction and circular polarisation with rise of temp. The transformation takes place in three temp. steps. The lower two are accompanied by considerable variations in double refraction, but not the third. All three steps are accompanied by a variation in the increase of circular polarisation.

A. J. M.

Dependence of modulus of elasticity and the damping of transversely vibrating metal rods on the amplitude. F. FORSTER and W. KOSTER (Naturwiss., 1937, 25, 436—439).—The modulus of elasticity and damping of paramagnetic metals and alloys are independent of the amplitude of transverse vibrations, if not too large. For ferromagnetic metals and alloys (e.g., Ni-Fe), however, both modulus and damping are dependent on amplitude, varying in a similar way to magnetostriction.

A. J. M.

Elasticity of long-chain substances as a statistical effect. H. MARK (Österr. Chem.-Ztg., 1937, 40, 321—327).—Theoretical. The free rotation of long-chain compounds and the differences between their properties on stretching and those of normal substances are discussed. An expression connecting the distance between the ends of a single haphazardly arranged long-chain mol. with the length of each member of the chain, the valency angle, and the no. of C atoms in the chain is derived. The max. val. of this expression gives the most probable val. for the distance between the ends of the chain, $l\sqrt{(2n/3)}$, where l is the length of the linking between each C

atom and n is the no. of linkings in the chain. The energy necessary to stretch the chain leads to an expression similar to that for the heat developed on adiabatically compressing a gas. Thus the pressure of a gas tending to increase the vol. is similar to the attraction between the ends of a stretched chain tending to reduce its length. Viewed in this way, the evolution of heat on stretching rubber-like substances, contrary to the behaviour of normal substances, is explained. An equation of state for an ideal rubber, *i.e.*, a rubber the internal energy of which is independent of the amount of stretch, is formulated. The behaviour at high degrees of stretching, when crystallisation occurs, is briefly discussed. C. R. H.

Relation between temperature and the conical indentation hardness of metals. J. ENGL and J. KATZ (*Z. Physik*, 1937, 106, 1—8).—Measurements of the hardness of polycryst. samples of Cu, Ni, Mo, and W over the range 0° to -191.5° are reported.

H. C. G.

Heat-treatment and diffusion in salt crystals. E. REXER (*Z. Physik*, 1937, 106, 93—101).—Heat-treatment of salt crystals leads to an inhomogenising of the crystal which is observable in the properties most sensitive to structural changes. Inhomogeneity is due to diffusion of impurities in the crystal.

L. G. G.

Optical and photochemical investigation of phosphorus. G. RATHENAU (*Physica*, 1937, 4, 503—514).—The photochemical conversion of white P into red P is a unimol. reaction; P_2 mols. are first formed and recombine to give P_4 (red), P_4 (white in CS_2) $\rightarrow 2P_2 \rightarrow P_4$ (red). The absorption of both modifications is of the same order, and increases towards the ultra-violet.

F. J. L.

Dimorphism of white phosphorus. G. NATTA and L. PASSERINI (*Atti R. Accad. Lincei*, 1936, [vi], 24, 464—471).—X-Ray measurements at -35°, -55°, and -170° confirm the existence of α - and β -forms of white P. The α -form gives very weak lines, from which the lattice dimensions cannot be determined. This is attributed to the strong thermal agitation of the mols. and not to the transformation into the red form by the action of the X-rays. The β -form shows a well-marked cryst. structure, probably hexagonal, c/a 1.6, a 3.55 Å., 36 mols. per unit cell, d_{calc} 2.12. These vals. have been obtained by means of the powder method and are not exact. It is possible that the structure may be of a lower symmetry type, *e.g.*, pseudo-hexagonal.

O. J. W.

Investigation of polymorphic transformations of the alkaline-earth carbonates by the emanation method. K. E. ZIMENS (*Naturwiss.*, 1937, 25, 429—431).—The emanation method of Hahn (A., 1929, 737) has been used to study the polymorphic transformations of $CaCO_3$ and $BaCO_3$. The emanation from calcite first begins to increase considerably at 600°; this is the "loosening" temp. at which the amplitude of motion of the lattice constituents becomes so great that they can change places in the lattice. Aragonite shows a considerable increase in the emanation at 450°, at which temp. the rhombic aragonite is converted into the hexagonal calcite. The change is monotropic, and the rate of transformation is dependent on the rate

of heating. At 910° the $CaCO_3$ dissociates. The "loosening" temp. of CaO is 1200°. $BaCO_3$ undergoes an enantiotropic transformation at 800°, recrystallisation occurs at 1200°, and dissociation at 1360°.

A. J. M.

Polymorphism of crystalline liquids. D. VORLÄNDER (Ber., 1937, 70, [B], 1202—1212).—Of 2561 aromatic, mostly complex, compounds, which contain at least one p -substituted C_6H_6 nucleus in the mol., > one third are solid cryst. dimorphous and about 10 trimorphous, whereby the one solid form is usually monotropic to the second or third variety independently of whether the cryst. liquid form is monotropic or enantiotropic to a solid-cryst. variety. The solid polymorphous forms are distributed among these compounds without apparent relationship to saturation or unsaturation, to longer or shorter mols. Only in isolated regions the double linkings $\cdot CH:N \cdot$ and $\cdot CH:CH \cdot$ appear more favourable than $\cdot CH_2:NH \cdot$ or $\cdot CH_2:CH_2 \cdot$ to the development of the phenomenon. Polymorphism of cryst. liquids appears more subject to regularities, since the possibilities are restricted by the greater mobility of the mols. and association arises only with certain types. Of the 2561 compounds, 1238 are not and 1323 are liquid cryst. The latter all follow the law of the associative action and crystal construction of predominatingly unidimensional, linear or extended mols., whereas the other substances are not cryst. liquid by reason of departure from this structural condition. Of 1323 liquid cryst. substances, 135 give two and 51 afford 2—4 liquid cryst. forms. The simpler hydrocarbons with 1—4 C_6H_6 nuclei, Ph_2 , C_6H_4Ph , and $(C_6H_4Ph)_2$ are not liquid cryst. $C_6H_4(C_6H_4Ph)_2$ and $(C_6H_4C_6H_4Ph)_2$ are liquid cryst. In presence of O or groups containing O liquid polymorphous phenomena occur first with derivatives of p - $C_6H_4Ph_2$. The majority of such compounds are aromatic substances containing N. Double linkings in conjunction with C_6H_6 nuclei can be of outstanding importance even in the absence of N and p -substituents. Extensive linear accumulation of double linkings and p -substituted C_6H_6 nuclei imparts high m.p. and super-cryst. structure. The majority of aliphatic, non-saline substances are not liquid cryst. Polymorphous liquid cryst. forms of the alkali and TI salts of carboxylic acids are almost unknown. The different types of cryst. liquids and their subdivisions are described and methods for the detection of their interconversion are detailed. Polymorphous liquid cryst. substances with > two cryst. liquid forms are listed.

H. W.

Superconducting state. F. B. SILSBEE (*J. Washington Acad. Sci.*, 1937, 27, 225—244).—A lecture dealing with the development and results.

A. J. M.

Relaxation phenomena in superconductivity. W. H. KEESOM and P. H. VAN LAER (*Proc. K. Akad. Wetensch. Amsterdam*, 1937, 40, 390—391).—The transition from the superconductive to the non-superconductive state of Sn, if effected by heating in const. magnetic field, takes place with a relaxation of about 30 sec.

O. D. S.

Measurements of the latent heat of tin in passing from the superconductive to the non-

superconductive state at constant temperature. W. H. KEESOM and P. H. VAN LAER (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 390).—Measurements were made at 2.971°, 2.362°, 2.303°, 1.835°, and 1.239° abs. Vals. support the assumptions that the transition process is reversible and occurs through an intermediate state. O. D. S.

Induction of currents in superconductors. P. GRASSMANN and H. EICKE (Physikal. Z., 1937, 38, 429–437).—Experiments on the induction of currents in superconducting rings of Pb, Sn, Ta, Sn–Hg, Cu–Sn, and Cu–Pb at different temp. show that in the case of the first induced current only part of the energy taken up by the conductor reappears in the induced current. The total energy taken up is independent of the time for which the current flows. When a current is induced in a superconductor a second or third time, the current being the same in intensity and direction as the first, there is, in general, no further considerable consumption of energy, but if the current is induced in the opposite direction, about twice the original energy is taken up. A. J. M.

Theory of superconductivity. L. LANDAU (Physikal. Z. Sovietunion, 1937, 11, 129–140).—It is shown that when the mean val. of the magnetic field of a superconductor is not zero, the superconductor does not consist of two regions, one superconducting and the other not, but of a large number of layers alternately superconducting and inert. From this follows an explanation of Peierls' transition state. A. E. M.

Sommerfeld and Frenkel electron theories of metals. M. SATÔ (Sci. Rep. Tohoku, 1937, 25, 1136–1140).—Mathematical. The two theories give similar expressions for conductivity. F. J. L.

Diamagnetism of an electron gas. A. PAPA-ETROU (Z. Physik, 1937, 106, 9–16; cf. A., 1931, 411).—Landau's results on the diamagnetism of free electrons are valid only for field strengths above a definite limit. In weaker fields complete diamagnetism is to be expected. H. C. G.

Variation of magnetic susceptibility of water with temperature. K. HONDA and Y. SHIMIZU (Sci. Rep. Tohoku, 1937, 25, 939–945).—Theoretical. Susceptibility and temp. variation are calc. on the assumption that the H₂O mol. can be regarded as a neutral atom. F. J. L.

Change of magnetic susceptibility in metals during melting and allotropic transformation. Y. SHIMIZU (Sci. Rep. Tohoku, 1937, 25, 921–938).—The abrupt change in magnetic susceptibility during melting or allotropic change is recorded for Cu, Ag, Au, Sn, Al, Hg, Tl, Na, K, Rb, and Cs. It is due to change in lattice const. resulting in alteration in the proportion of bound and free electrons. F. J. L.

Magnetic analysis of evaporated bismuth deposits. C. T. LANE (Physical Rev., 1937, [ii], 51, 863–869).—Magnetic susceptibilities of Bi films 0.1–4 μ thick were measured by a compensated Gouy method with Sartorius microbalance. The val. for films of thickness >0.5 μ is independent of thickness, and agrees with that of a single crystal with trigonal

axis parallel to the field; for <0.5 μ the val. decreases as thickness is reduced, and the existence of a micro-cryst. fibre structure, merging into a phase of macro-cryst. structure at >0.5 μ , is suggested. Ageing for long periods in vac. increases the susceptibility of films <0.5 μ , the effect being ascribed to a recrystallisation process, but for thicker films this effect is not found. The susceptibility of films >0.5 μ is identical when deposited, respectively, on glass, Au, Cu, and Sn. The susceptibility varies with the residual gas pressure during deposition and, in a different manner, with pressure, according as the field is parallel or perpendicular to the film. N. M. B.

Magnetic susceptibility of vapours of organic compounds. J. SCHUR (Physikal. Z. Sovietunion, 1937, 11, 194–203).—A method for the determination of χ of org. vapours is described. It is shown, in disagreement with other investigators, that χ for CS₂ and C₆H₆ is not changed in passing from the liquid to the vapour state. L. G. G.

New results of investigations on supersonic waves. E. HIEDEMANN (Chem. Weekblad, 1937, 34, 390–397).—A review dealing with methods of producing supersonic waves, optical methods of detecting them, their chemical and dispersing effects, and their coagulating effect on some colloids. A. J. M.

Velocity of sound in solutions and its relation to velocity of sound in the solutes. W. SCHAAFFS (Z. Physik, 1937, 105, 658–675).—Light from a slit illuminated by monochromatic Hg radiation is passed transversely through solutions in which ultrasonic waves are generated. The velocity of sound is calc. from the separation of the resultant diffracted images, and its val. for solutes is obtained by extrapolation of curves for corresponding solutions. L. G. G.

Calculation of the specific heats and entropies of metal vapours from spectroscopic data, with special reference to gaseous iron and copper. K. K. KELLEY (U.S. Bur. Mines, 1937, Rept. Invest. 3341, 19 pp.).—Expressions have been derived for the partial sp. heat and entropy of a monat. gas due to changes in electronic energy. From recorded data of energy levels of gaseous Fe and Cu, the calc. vals. have been added to the vals. due to translational energy, $c_{p, tr}$ = 4.967 and S_{tr} being calc. from the Sackur equation, in order to obtain the true vals. of c_p and S . Up to 1500° abs. c_p for gaseous Cu = 4.967, but with further rise in temp. c_p increases to 7.795 at 5000° abs. With rise in temp. c_p for gaseous Fe increases rapidly from 4.967 at abs. zero to 6.145 at 350° abs., decreases to 5.290 at 1300° abs., and again increases to 7.049 at 4000° abs. and to an estimated val. 7.922 at 5000° abs. No explanation of the abnormality at low temp. is offered. C. R. H.

Heat capacities of selenium crystals, selenium glass, and tellurium at low temperatures. C. T. ANDERSON (J. Amer. Chem. Soc., 1937, 59, 1036–1037).—Heat capacities of cryst. Se and Te for 50–300° abs. are recorded; the corresponding entropies are 10.49 and 12.85, respectively. Data for Se glass indicate the difference in entropy between 0° and 298.1° abs. to be 11.15. E. S. H.

Specific heats of metals at high temperatures. XXVIII. **Heat capacity and electrical resistance of didymium between 300° and 600°.** F. M. JAEGER, J. A. BOTTEMA, and E. ROSENBOHM (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 481—489).—The sp. heat of didymium was measured from 20° to 600°. Consistent results were obtained only after repeated heating and cooling. The curve of c_p against T shows a transition region between 440° and 467°, and a transition point at 567.5°. From 340° to 440°, $c_p = 0.05941 + 0.16 \times 10^{-5}(t - 340)$, $C_p = 8.430 + 0.227 \times 10^{-3}(t - 340)$. From 467° to 560°, $c_p = 0.06200 + 0.366 \times 10^{-4}(t - 467)$, $C_p = 8.798 + 0.5193 \times 10^{-2}(t - 467)$. From 575° to 600°, $c_p = 0.0665 + 0.14 \times 10^{-3}(t - 575)$, and $C_p = 9.460 + 0.01986(t - 575)$. Data of the electrical resistance between 20° and 600° are tabulated. A transition point is indicated between 508° and 540°.

O. D. S.

Volumes of mercury menisci. W. H. KEESOM, (Miss) H. VAN DER HORST, and K. W. TACONIS (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 389).—Vols. of Hg menisci, measured from X-ray shadowgraphs, are tabulated for tubes of radius² from 10 to 100 sq. mm. and meniscus heights from 0.7 to 2.0 mm.

O. D. S.

Densities and vapour pressures of alkyl-benzenes, aliphatic ketones, and *n*-amyl chloride. J. C. RINTELEN, jun., J. H. SAYLOR, and P. M. GROSS (J. Amer. Chem. Soc., 1937, 59, 1129—1130).—The *v.p.* of PhEt, *o*-, *m*-, and *p*-xylene, *n*-amyl chloride, COMePr^β, COMeBu^β, COEt₂, COPr₂, and COBu₂, and the *d* of *n*-amyl chloride, COMePr^β, COMeBu^β, and COBu₂ have been determined at 10°, 30°, and 50°.

E. S. H.

Porous structure and specific volume of amorphous and crystalline substances. G. GRAUE and N. RIEHL (Naturwiss., 1937, 25, 423—425).—A modification of the emanation method of Hahn (A., 1929, 737), in which the emanation is applied externally, and the amount which has penetrated into the porous substance is determined, is used to estimate the "inner surface" of substances. The method is applied to the examination of the porous structure and true sp. vol. of cryst. and pptd. ZnS, the results being compared with sp. vols. determined by a pycnometer. The sp. vol. of pptd. ZnS by the pycnometer method was 0.264, and by the emanation method 0.204, showing that in amorphous ZnS there are pores or clefts of at. dimensions due to an irregular arrangement of atoms. Gases may penetrate into the interior of a solid catalyst not only by macroscopic pores, but also by interat. pores and crevices due to deformed lattices.

A. J. M.

Thermodynamics of phase changes extending over a definite temperature range. A. J. RUTGERS and S. A. WOUTHUYSEN (Physica, 1937, 4, 515—520; cf. this vol., 242).—Theoretical. F. J. L.

Coefficient of thermal expansion of magnesium oxide. M. A. DURAND (Physics, 1936, 7, 297—298).—The thermal expansion of single-crystal MgO has been measured from 85° to 480° abs. Data are combined with those of Austin (B., 1932, 64) and

tabulated up to 1273° abs. In accordance with Grüneisen's relation the thermal expansion \propto the heat content.

O. D. S.

Viscosity of air. W. N. BOND (Proc. Physical Soc., 1937, 49, 205—213).—A detailed account of results previously reported (cf. A., 1936, 931). The theory of the capillary-tube method used and the corrections involved are given. The val. at 23° is $(1834.7 \pm 0.8) \times 10^{-7}$ c.g.s.

N. M. B.

Viscosity of chlorides of inorganic acids. V. **Viscosity of vanadyl and chromyl chlorides.** A. I. LICHATSHEVA and G. P. LUTSCHINSKI (J. Gen. Chem. Russ., 1937, 7, 621—622).—The η of VOCl₃ and CrO₂Cl₂ varies with temp. in accordance with Lutschinski's formula (J. Phys. Chem. Russ., 1935, 6, 700).

R. T.

Influence of electric field on viscosity of liquids. O. KIMURA (Bull. Chem. Soc. Japan, 1937, 12, 147—149).—When a 5% solution of stearic acid in C₆H₆ flows in a transverse electric field, the η increases nearly linearly with the field strength up to about 17,000 volts per cm., when it undergoes no further change. It is calc. that at the highest field strength used (30,000 volts per cm.) only a small fraction of the mols. are oriented parallel with the field, and that the viscosity increase is due to mol. association.

F. L. U.

Flow of gaseous mixtures through capillaries. I. **Viscosity of binary gaseous mixtures.** H. ADZUMI (Bull. Chem. Soc. Japan, 1937, 12, 199—226).— η -composition curves have been determined at 20—100° for H₂-CH₄, H₂-C₂H₂, H₂-C₂H₆, H₂-CHMe:CH₂, CH₄-C₂H₂, C₂H₂-CHMe:CH₂, and CHMe:CH₂-C₃H₈. The first four give max., and the curvature in all cases increases with disparity of the mol. wt. of the components. Of the formulæ proposed for the η of gaseous mixtures, one which embodies Kuenen's principle of the persistence of mol. velocity is considered the most appropriate, and with a suitable choice of consts. is found to reproduce the experimental vals. satisfactorily. Conditions for the occurrence of max. are deduced from the formula and found to apply in 50 out of 55 cases examined. The composition corresponding with the max. is displaced by change of temp. Mean free paths of the component gases are calc. Generally, the mean free path of each component in a binary mixture is changed in the direction of the mean val.

F. L. U.

Variations in viscosity with concentration in binary liquid mixtures. H. LEMONDE (Compt. rend., 1937, 204, 1628—1630).—Binary liquid mixtures are classified on the basis of the variation of η and diffusion factors with the composition. R. S. B.

Combination of fatty acids with nitrogen bases. IV. **Diethylamine and propionic acid: densities, surface tensions, conductivities, and viscosities of the liquid anhydrous system.** R. N. COLEMAN and E. B. R. PRIDEAUX (J.C.S., 1937, 1022—1026; cf. this vol., 241).—NH₄Et₂ salts of the saturated fatty acids C₃—C₆ are viscous liquids completely miscible with EtOH, Et₂O, and C₆H₆. The C₃ and C₄ salts give clear solutions with H₂O

at all dilutions, whilst the others show turbidity beyond a certain dilution. $\text{EtCO}_2\text{NH}_2\text{Et}_2$ melts at 13° , $\text{Pr}^n\text{CO}_2\text{NH}_2\text{Et}_2$ at 23° , and $\text{Bu}^n\text{CO}_2\text{NH}_2\text{Et}_2$ less sharply at about 6° . The higher members failed to crystallise. The d -, σ -, and η -composition curves for $\text{EtCO}_2\text{H}-\text{NH}_2\text{Et}_2$ mixtures all exhibit a max. on the acid side of the normal salt composition. The conductivity (κ and Λ) curves show two max. The properties generally resemble those of the corresponding piperidine system.

F. L. U.

Equilibrium isotherms and isobars of binary mixtures above the critical points of their constituents. V. FISCHER (Ann. Physik, 1937, [v], 29, 514—526).—Theoretical. The v.p.-composition curve for $\text{CH}_4-\text{C}_3\text{H}_8$ mixtures at 20° has been examined. Equations for the calculation of equilibrium condens. are derived, and the conditions of equilibrium when the temp. and pressure of the constituents are $<$ crit. vals. are obtained.

A. J. M.

Quantitative regularities in homologous series. J. H. C. MERCKEL (Kolloid-Beih., 1937, 45, 413—470).—For aq. solutions of fatty acids, alcohols, and urethanes the slope of the surface tension-concn. curve is related linearly to the no. of C atoms. Variations at very low and high condens. are traced to differences in the orientation of the surface mols. The surface tensions of aq. solutions of Na salts of fatty acids have been determined and compared with the capillary-active vals. A relation between the adsorption of fatty acids by blood charcoal and by potato starch and the no. of C atoms in the fatty acids has been established. The viscosities of aq. solutions of the lower fatty acids and their Li, Na, and K salts, of the Na salts of dicarboxylic acids, and of the lower alcohols are related linearly to the no. of C atoms.

E. S. H.

Cryoscopy and conductivity of halogen acids in ethyl alcohol-benzene solution. I. S. GALINKER (Ukrain. Chem. J., 1937, 12, 212—220).—Association of EtOH in C_6H_6 rises with increasing $[\text{EtOH}]$, and is less in presence of HCl , HBr , or HI . The depression of f.p. of solutions of HX in C_6H_6 falls with increasing $[\text{EtOH}]$ to a min., corresponding with formation of $3\text{EtOH}\cdot\text{HX}$. In absence of EtOH the acids are monomeric in C_6H_6 . Conductivity in the systems $\text{C}_6\text{H}_6-\text{EtOH}-\text{HX}$ rises in the series $\text{X} = \text{Cl} < \text{Br} < \text{I}$.

R. T.

Application of thermal analysis to the determination of thermal effects in binary and ternary systems. Measurements of (I) specific heat of solids and liquids, (II) latent heat of fusion of solids. K. HRYNAKOWSKI and A. SMOCZKIEWICZOWA (Rocz. Chem., 1937, 17, 140—145, 165—168).—I. Approx. vals. for sp. heat are given by Regnault's rate of cooling method.

II. Approx. vals. for latent heat of fusion are given by Tammann's method, depending on determination of rate of crystallisation.

R. T.

Vapour pressures of concentrated aqueous solutions. Two co-existing liquid phases. T. KUME (Rev. Phys. Chem. Japan, 1937, 11, 16—24).—Results for aq. solutions of BzOH and cinnamic acid

at temp. between 80° and 180° are recorded and discussed.

W. R. A.

Calculation of pressure effect on liquid-vapour equilibrium in binary systems. B. F. DODGE and R. H. NEWTON (Ind. Eng. Chem., 1937, 29, 718—723).—The same general differential equation is obtained for the influence of pressure on the composition of the two phases whether the equilibrium is considered in terms of chemical potential or of fugacity. Since there are insufficient data to permit a rigorous integration, the assumption of ideal solutions is made in order to apply the theory to the four special cases represented by slightly sol. gases in volatile and in relatively non-volatile solvents, very sol. gases in non-volatile solvents, and both components volatile and the temp. below the crit. temp. for each of the components. The equation obtained for the second case is shown from data in the literature to hold accurately for some permanent gases dissolved in H_2O and NH_3 , but that derived for the first is not supported by published data for the solubility of CO_2 in C_6H_6 , and of NH_3 in H_2O .

R. C. M.

D. I. Mendeleev's singular points" in the theory of solutions and the topology of the chemical diagram. N. S. KURNAKOV (Trav. Congr. Jubil. Mendelée, 1936, 1, 557—577).—A lecture. The importance of points of discontinuity in property-composition curves, first visualised by Mendeleev, is described.

J. W. S.

Mendeleev's theory of solutions and the metric of the chemical diagram. N. I. STEPANOV (Trav. Congr. Jubil. Mendeleev, 1936, 1, 599—617).—A lecture. The quant. applications of property-composition curves are discussed.

J. W. S.

Course of transformations in the irreversible iron-nickel alloys. F. WEVER and H. LANGE (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 217—225).—The process has been followed by means of magnetic measurements, supplemented by X-ray analysis.

E. S. H.

Heats of formation of nickel-silicon alloys and melts. W. OELSEN and H. O. VON SAMSON-HIMMELSTJERNA (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 131—133).—The heats of formation of Ni-Si alloys show discontinuities at compositions corresponding with Ni_2Si and NiSi . The heat contents of Ni-Si melts at 1600° are $<$ those calc. from the components. The heats of formation in the liquid state at 1600° are $>$ in the solid state; the max. val. is 14 kg.-cal. per g.-atom at 40 at.-% of Si. Ni silicides exist in the liquid state; the amount of dissociation is small when excess of Ni or Si is present.

E. S. H.

Hall effect and some other physical constants of alloys. IV. Silver-tin series of alloys. W. G. JOHN and E. J. EVANS (Phil. Mag., 1937, [vii], 23, 1033—1048; cf. A., 1936, 1332).—The resistivity, Hall effect, coeff. of resistance, thermoelectric power (with respect to Cu), and d of Ag-Sn alloys have been measured. The phase boundaries observed at 74, 81, 87.5, and 89% Ag are in complete agreement with those determined by Murphy (cf. B., 1926, 278, 792).

F. J. L.

Solid solubility of cadmium in lead and the absence of change in the lattice parameter of the lead. E. JENCKEL and H. MADER (Metallwirts., 1937, 16, 499—502).—According to hardness and electrical resistivity measurements the solubility is 3.1% at the eutectic point and approx. 0.6% at room temp. The lattice parameter of Pb is reduced by only 0.6×10^{-3} Å. by the Cd. C. E. H.

Ternary alloys. R. PARIS (Publ. sci. tech. Min. de l'Air, No. 45, 1—86; Chem. Zentr., 1936, i, 3572).—The Mg-Ca-Zn system and its constituent binary systems are discussed. The Ca-Mg system has a max. in the liquidus curve at Mg_5Ca_3 (49.7% Ca, m.p. 725°); the Mg-Mg₅Ca₃ eutectic is at 17% Ca, 525°; Ca-Mg₅Ca₃ eutectic at 82% Ca, 460°. For the Ca-Zn system, Donski's results (A., 1908, ii, 278) are generally confirmed, but the phase Ca_5Zn_2 is also indicated. Ca_2Zn_3 exists in two modifications, α stable above 430°, β stable at 411—430°, with a peritectic point at 411°, 64% Ca. The Ca-Ca₅Zn₂ eutectic is at 68% Ca, 385°. The ternary system shows a compound $Mg_5Zn_5Ca_2$, m.p. 495°. Mechanical properties are recorded for alloys with 98% Mg, 1% Ca, 1% Zn, and 96% Mg, 2% Ca, and 2% Zn. J. S. A.

Solubility of krypton in various liquids. J. A. M. VAN LIEMPT and W. VAN WIJK (Rec. trav. chim., 1937, 56, 632—634).—Data for the solubility of Kr (containing 5% of Xe) in H₂O and various org. solvents are recorded. The low solubility in glycerol suggests the suitability of the latter as a sealing liquid. C. R. H.

Solubility of ozone in water and aqueous sulphuric acid of various concentrations. L. I. KASCHTANOV and O. N. OLESCHTSCHUK (J. Gen. Chem. Russ., 1937, 7, 839—841).—The solubility of O₃ in aq. H₂SO₄ at 20° is at a max. in 10% H₂SO₄, and follows Henry's law for a given [H₂SO₄]. Neither H₂SO₅ nor H₂S₂O₈ is formed. R. T.

Solubility of anhydrous sodium bromide in water and liquid ammonia. G. K. DISTANOV (J. Gen. Chem. Russ., 1937, 7, 676—680).—The solubility of NaBr in H₂O rises continuously from 54.2 at 107° to 60.8% at 248°. In liquid NH₃ the solubility rises from 25% at -22° to a max. of 54% at 13—75°, above which it falls gradually to 41.0% at 160°. R. T.

Solubility of lithium chloride in water between 70° and 160°. J. N. FRIEND, R. W. HALE, and S. E. A. RYDER (J.C.S., 1937, 970; cf. A., 1932, 117).—The transition $LiCl \cdot H_2O$ $LiCl$ is at about 96°. The solubility of the anhyd. salt, for which data are recorded, is a linear function of temp. Kremer's results are in general too high. F. L. U.

Solubility of lithium carbonate in water saturated with carbon dioxide under high pressures and properties of the solutions. O. HÄHNEL (J. pr. Chem., 1937, [ii], 148, 295—309).—Solutions of Li₂CO₃ in aq. CO₂ contain LiHCO₃. Dissociation pressures of the solutions between -12° and 60° are given. The solid could not be isolated in a pure state. The solubility of LiHCO₃ decreases with rise of temp. Addition of EtOH to a saturated

aq. solution produces evolution of CO₂ and pptn. of Li₂CO₃. Conductivity data are recorded. F. L. U.

Solubility of aragonite in salt solutions. A. A. BROWMAN and A. B. HASTINGS (J. Biol. Chem., 1937, 119, 241—246).—The solubility of aragonite has been determined at 38° in 0—0.16*M*-NaCl and in presence of CO₂ sufficient to maintain a p_H of 7.2—7.6. Aragonite is more sol. than calcite (cf. A., 1927, 416), the ratio of the solubility products being 1.41. Solubility data for CaCO₃ gallstones show that they consist of aragonite. J. W. S.

Solubility of slightly soluble electrolytes, precipitated in presence of their reaction products. Application to silver chloride. C. BEDEL (Compt. rend., 1937, 204, 1651—1654).—The solubility (*S*) of AgCl has been determined by observing the point of appearance of ppt. when 0.001*N* solutions of Cl⁻ are dropped into 0.001*N*-AgNO₃. *S* is approx. independent of other electrolytes, except for Hg salts, which increase it. *S* increases slightly as the concn. of reactants decreases, and the val. extrapolated to zero concn. of electrolytes is 4.4×10^{-4} g. per litre at room temp. R. S. B.

Aqueous solubilities of isomeric pentanols. P. M. GINNINGS and R. BAUM (J. Amer. Chem. Soc., 1937, 59, 1111—1113).—Data for the 8 isomerides at 20°, 25°, and 30° are recorded. Solubility is in the order *tert.* > *sec.* > primary isomerides and increases as the OH group approaches the middle of the mol. In the primary and *sec.* isomerides the solubility increases with greater compactness of mol. structure. In general, increasing aq. solubility goes with increasing solubility of H₂O in the alcohol. The aq. solubility of all the isomerides decreases with rise of temp. from 20° to 30°. E. S. H.

Chemistry in liquid sulphur dioxide. V. Solubility of inorganic substances in liquid sulphur dioxide. G. JANDER and W. RUFFOLT (Z. physikal. Chem., 1937, 179, 43—50).—Solubilities at 0° are recorded. The salts with the highest solubilities are those which tend to form definite solvates with SO₂. R. C.

Diffusion and reaction of hydrogen in potassium bromide crystals. R. HILSCH (Ann. Physik, 1937, [v], 29, 407—420).—The solubility of H₂ in KBr crystals has been measured at 520°, 600°, and 680°. The reaction $2K + H_2 = 2KH$ takes place in the crystal lattice when the crystal is heated in a mixture of H₂ and K vapour. The equilibrium const. at 680° has been measured and the dissociation of KBr-KH mixed crystals calc. The diffusion consts. *D* for H₂ and for KH mols. in the lattice have been measured. *D* for H₂ is of the same order as that for the colour centres. O. D. S.

Gibbs adsorption equation and adsorption on solids. D. H. BANGHAM (Trans. Faraday Soc., 1937, 33, 805—811; cf. A., 1935, 29).—Theoretical. Discrimination is made between similarities in the properties of surface films which are a necessary consequence of thermodynamic laws and those which indicate real similarity of behaviour. F. L. U.

Adsorption of solvent vapour by solute crystal. I. UHARA and M. NAKAMURA (Bull. Chem. Soc. Japan,

1937, 12, 227—232).—"Lumping" of crvst. powders in moist air occurs when the R.H. is about 2/3 of the val. which corresponds with a saturated solution of the substance, and is therefore not necessarily due to deliquescence. The phenomenon has been studied with NaCl, KBr, tartaric acid, and sucrose, and is shown to be caused by adsorption of H₂O vapour, which increases the range of mobility of the surface ions or mols. and thus facilitates rearrangement of the crvst. surface. The adsorption also leads to chemical action in certain cases; e.g., (NH₄)₂SO₄ and Ca(OH)₂ react at R.H. 76%, but not at 63%.

F. L. U.

Investigation of adsorption of water and carbon dioxide by active oxides by Hahn's emanation method. R. MUMBRAUER (Z. physikal. Chem., 1937, B, 36, 20—26).—The sorption at room temp. of H₂O by active Fe^{III} and Be oxides and of CO₂ by active Be oxides is a process of reversible adsorption. The adsorption of H₂O reversibly increases the emanating power, *E*, by loosening the secondary structure, whilst CO₂ has the reverse effect. H₂O and CO₂, when present together, increase *E* for highly active BeO.

R. C.

Adsorption of ethane, ethylene, acetylene, and hydrogen and the polymerisation and hydrogenation of ethylene and acetylene by carbon, carbon contacts, and active iron. R. KLAR (Z. Elektrochem., 1937, 43, 379—389).—Adsorption isotherms for C₂H₄ and C₂H₆ on C containing varying amounts of Fe have been determined. The heat of adsorption rises with increasing Fe content; by comparison with active Fe the distribution of the adsorbate on the contact surface has been investigated. The sorption of C₂H₂ can be differentiated into two stages, represented by momentary physical adsorption followed by a slow activated adsorption, and the corresponding heats of adsorption and activation have been determined. The influence of the Fe content of C on the adsorption of H₂ and the influence of the activation temp. on the heat of activation show that adsorption does not occur at the C surface, but at active Fe centres. The activated adsorption of C₂H₂ is a first-order reaction. The apparent energy of activation of the polymerisation of C₂H₄ has been calc. The hydrogenation of C₂H₄ at C contacts at 75—150° has been studied and the energy of activation determined; the mechanism has been elucidated by exchange with D₂. When mixed with H₂ in presence of C, C₂H₂ polymerises but is not hydrogenated.

E. S. H.

Adsorption of metallic cations by cellulose. Isoelectric point of cellulose. (MME.) J. GAVORET (Compt. rend., 1937, 204, 1643—1645; cf. A., 1932, 908).—The adsorption of Pb⁺⁺ by cellulose has been studied at *p*_H 1.2—5.4. Below *p*_H 2.7 there is no adsorption, and above this point adsorption increases rapidly with *p*_H. The crit. *p*_H is independent of [Pb⁺⁺] or of the source of the cellulose, and it is suggested that this is the isoelectric point.

R. S. B.

Effect of uni-univalent electrolytes on interfacial tension between *n*-hexane and water. A. W. EVANS (Trans. Faraday Soc., 1937, 33, 794—800).—Interfacial tension-concn. curves have been

obtained for Li, Na, K, Rb, and Cs chlorides, NaOH, and KCNS at 25°. The results support the theory of Onsager and Samaras (A., 1934, 1068) as opposed to those of Ariyama (this vol., 179) and Oka.

F. L. U.

Interpretation of adhesion tension data. K. S. G. DOSS (J. Indian Chem. Soc., 1937, 14, 160—166).—Theoretical. The work of Bartell (A., 1935, 29) is criticised.

F. J. G.

Pseudo-extraction and some specific properties of films obtainable thereby. L. I. BELAIEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 137—140).—When inorg. hydrosols are emulsified with org. liquids immiscible with H₂O, the disperse phase collects at the interface, forming a film. The most suitable liquid is *iso*-C₅H₁₁-OH. Film formation is retarded in highly conc. and dil. sols. The Au films obtained were golden in colour by reflected and blue or violet by transmitted light. Lamellar films, e.g., of Au, were found to consist of discrete lamellae 0.05—0.5 mm. in diameter, situated above the interface in the non-aq. layer. The influence of p.d., added reagents, and streams of bubbles and liquid is described.

R. S. B.

Binding of solvents by immobilisation. F. EIRICH, H. MARK, and T. HUBER (Papier-Fabr., 1937, Fest- u. Auslandsheft, 251—258).—By measuring the rate of fall in oil of small bodies with holes bored through them it is shown that the liquid in the holes is largely immobilised. In colloid particles with a porous structure, solvent may therefore be immobilised by purely hydrodynamic forces.

A. G.

Diffusion of electrolytes through a membrane. I. M. KONO and E. UTSUNOMIYA (J. Chem. Soc. Japan, 1935, 56, 1475—1482).—The rates of penetration of 0.1*N*-alkali salts through Cellophane at 25° are in the order KBr > KI > KCl > NH₄Cl > NaCl > LiCl, and KNO₃ > NH₄NO₃ > NaNO₃ > LiNO₃.

CH. ABS. (c)

Permeability of membranes. V. Origin of bioelectric currents. K. H. MEYER (Helv. Chim. Acta, 1937, 20, 634—644).—P.d. across a membrane is attributed to ionic changes in the liquid in contact with the membrane rather than to variations in permeability of the membrane. A cell is described in which a portion of an electrolyte solution is separated from the remainder by means of two membranes, one permeable to anions, the other to cations. Ionic changes in the middle compartment lead to p.d. between it and one or other of the outer compartments. Microscopical examination of the electric organ of the cramp-fish suggests that it is formed of a large no. of cells of this type in series. When treated with a mixture of methylene-blue and eosin, the lamellae of the organ are seen to be in pairs, being alternately dyed, the dorsal lamella blue (permeable to cations) and the ventral lamella red (permeable to anions).

C. R. H.

Diasolysis. H. BRINTZINGER and H. BEIER (Kolloid-Z., 1937, 79, 324—331).—The term "diasolysis" is applied to the passage of substances sol. in org. solvents, e.g., NH₂Ph, NO₂-C₆H₄-OH, etc., through membranes of rubber and similar materials,

from an aq. solution. The process differs from dialysis in that it occurs only with organophilic solutes, and does not depend on the mol. wt. of the latter. The diasolysis coeff. (D) is largely determined by the ratio (solubility in membrane material)/(solubility in liquid). D has been measured for a raw rubber membrane and aq. solutions of NH_2Ph and o -, m -, and p - $\text{NO}_2\cdot\text{C}_6\text{H}_4\cdot\text{OH}$. The normal hydrolysis equilibrium of aq. o - $\text{NO}_2\cdot\text{C}_6\text{H}_4\cdot\text{OK}$ is displaced when the solution is separated from H_2O by a rubber membrane, owing to removal of the phenol by diasolysis.

F. L. U.

Osmotic pressure and gas pressure. K. FREDENHAGEN (Z. Elektrochem., 1937, 43, 415—421).—A reply to Meyer (cf. this vol., 236).

E. S. H.

Cryoscopic studies on transition points of compounds of organic solvents with salts. III. Congruent m.p. of alcoholates of alkali halides. H. OOSAKA (Bull. Chem. Soc. Japan, 1937, 12, 177—187; cf. A., 1933, 347).—The depression of the congruent m.p. of $\text{LiCl}\cdot 3\text{MeOH}$, $\text{LiCl}\cdot 4\text{EtOH}$, $\text{LiBr}\cdot 4\text{EtOH}$, and $\text{LiBr}\cdot 4\text{Pr}^n\text{OH}$ by H_2O and a no. of org. solutes has been determined and the cryoscopic const. calc. Abnormal vals. found when near homologues of the solvate alcohol are used are attributed to the formation of solid solutions of solute and alcoholate. Heats of fusion of the alcoholates are calc.

F. L. U.

Colloid phenomena. H. C. HAMAKER (Rec. trav. chim., 1937, 56, 727—747).—Colloid phenomena are discussed in relation to graphs in which the attractive and repulsive forces are plotted against the distances between the particles. Several types based on varying assumptions are considered, and two of these are shown to correspond closely with the properties of lyophobic and lyophilic colloids. The properties of these colloids are contrasted and their behaviour is interpreted in terms of the forces between the particles.

C. R. H.

Determination of size distribution curves and surface of comminuted materials, exemplified by flour. W. GRUNDER and H. SAUER (Kolloid-Z., 1937, 79, 257—273; cf. B., 1935, 520).—The size distribution in specimens of rye and wheat flours suspended in Et phthalate has been determined by measuring the variation with time of the concn. of the suspension at a fixed position in a cell in which the flours were sedimenting. The concns. were measured optically with a step-photometer and with a photo-electric cell. The method is simpler and quicker than the pipette method, and is applicable to any coarse dispersion in which light absorption is independent of particle size. The latter condition is not fulfilled by rice flour in castor oil or Et phthalate. Determination of surface area by measuring the light-reflecting power of the specimens agreed with that calc. from the size distribution.

F. L. U.

Cryolysis, diffusion, and particle size. IV. Caseinogen. H. LEICHTER, G. UMBACH, and F. F. NORD (Biochem. Z., 1937, 291, 191—208; cf. A., 1936, 157).—Measurements of n and light absorption show that in 0.1 and 0.2% solutions of caseinogen the particle size is decreased by freezing, whilst in 1% solution it is increased; the chemical properties are

not affected in either case. Hence the results of mol. wt. determinations based on rate of sedimentation (e.g., in the ultracentrifuge) may be untrustworthy.

W. McC.

Electric charge of a precipitate formed in presence of excess of either of its constituent ions.

I. S. G. CHAUDHURY and J. SEN-GUPTA (J. Indian Chem. Soc., 1937, 14, 133—140).—The charges of $\text{Cu}_2\text{Fe}(\text{CN})_6$, $\text{Zn}_2\text{Fe}(\text{CN})_6$, $(\text{UO}_2)_2\text{Fe}(\text{CN})_6$, and AgI are not simply determined by that of the ion present in slight excess, but depend on the concn. and in some cases vary with the time.

F. J. G.

Change of sign of electric charge in colloiddally dispersed and related systems. G. ANTONOFF (Kolloid-Z., 1937, 79, 331—334).—Within a limited range of acidity, electrolysis of an aq. suspension of auriferous SiO_2 leads to an anodic deposit consisting mainly of Ca, Fe, and Na (but no Au). The deposit is stable and dissolves in $\text{HCl} + \text{HNO}_3$ or $\text{HCl} + \text{H}_2\text{O}_2$. The mechanism of its formation is discussed.

F. L. U.

Electroviscous effect and reversal of charge in sodium arabate sols with uni-, bi-, and trivalent cations. L. W. J. HOLLEMAN and H. G. B. DE JONG (Kolloid-Beih., 1937, 46, 113—133).—Various electrolytes containing uni-, bi-, and trivalent cations have been shown to give a well-defined min. of η and a reversal of the charge in sols of Na arabate at 25°. The order of the concn. of cation required to reach the η min. is the same as that for the isoelectric point, viz., Ce^{+++} , UO_2^{++} , Pb^{++} , Cu^{++} , Cd^{++} , Ba^{++} , Ca^{++} , (Mg^{++} ?), Li^+ . The abs. concns., however, are not identical in the two series, the difference being attributed to the fact that the electrophoresis measurements were made on SiO_2 particles carrying an adsorbed film of the colloid. The results are not in agreement with the Einstein-Smoluchowski formula. The relation between η and electrolyte concn. is discussed.

F. L. U.

Anomalies in the dispersion of light by colloidal solutions of silver. C. JAUSSEAN (Compt. rend., 1937, 204, 1646—1649).— n has been determined for colloidal solutions of Ag for λ 6300—3330 Å. The dispersion, which resembles the anomalous dispersion in the region of an absorption band, agrees with the theory of Mie, Gans, and Happel (cf. A., 1913, ii, 85).

R. S. B.

Dispersion of depolarisation of light-scattering in colloids. II. Silver sols. R. S. KRISHNAN (Proc. Indian Acad. Sci., 1937, 5, A, 305—320; cf. this vol., 182).—The depolarisation factors and extinction coeffs. have been measured for six Ag sols at λ 2500—7000 Å. As in the case of Au sols, the depolarisation factors show a large increase in the region of characteristic absorption. The optical anisotropy of the Ag particles is low in the ultra-violet and red regions, but higher in the violet region, where the absorption is a max. Sols prepared by Bredig's method behave anomalously. The results are compared with the depolarisation factors and extinction coeffs. calc. from Gans' theory, and it is inferred that the particles behave optically as elongated ellipsoids with an axial ratio of 0.75. It is suggested that they may be in the form of minute

octahedra, which are optically equiv. to such prolate spheroids. The negative streaming double refraction and negative electric double refraction of these sols are explainable in terms of such particles.

J. W. S.

Surface tension of colloidal substances. S. N. BANERJI (Proc. Nat. Acad. Sci. India, 1936, 6, 317—320).—From measurements (not given) of the surface tension of aq. solutions of various hydrophilic substances it is inferred that the lowering is not due to a high degree of hydration.

F. L. U.

Colloid reactions and biological experiments with colloidal tungstic oxide. III. F. ERICH (Biochem. Z., 1937, 291, 51—60; cf. A., 1935, 296).—The conditions of flocculation of WO_3 sols by EtOH and electrolytes and their behaviour with regard to reversal of charge and protection on admixture with sols of Al_2O_3 , Fe_2O_3 , gum arabic, dextrin, and serum have been determined. The WO_3 sols are not changed by addition of COMe_2 , Et_2O , or sucrose. The absorption of X-rays by Au sols has been determined. The results of injecting WO_3 sols into rabbits are described.

E. S. H.

Coagulation of colloids. XVII. Anomalous coagulative power of aqueous mercury chloride. S. R. JOSHI and K. R. DAS (J. Indian Chem. Soc., 1937, 14, 167—171).—A comparison of the coagulating effects of KCl, BaCl_2 , AlCl_3 , and HgCl_2 on a no. of colloids shows that HgCl_2 is comparable with BaCl_2 . In view of the low ionisation of HgCl_2 the effect cannot be adequately explained.

F. J. G.

Electrolyte coagulation of weakly solvated sols and electrolyte activity. V. Influence of temperature. W. OSTWALD, H. KOKOROS, and K. HOFFMANN (Kolloid-Z., 1937, 79, 287—307; cf. A., 1936, 1200).—It is shown, on the basis of the Debye-Hückel theory, that the activity coeff. (f) of ions in aq. solution decreases with rising temp., in consequence of the decrease in dielectric const. Tables are given to show the relation between f and temp. at const. concn., and between the coagulating concn. (m) and temp. for const. f . Coagulation concns. of different types of electrolyte for As_2S_3 sols have been determined over the range 0—90°, and the results support the theory of coagulation previously published. An explanation of the spontaneous coagulation of electrolyte-free sols at temp. >100° is given.

F. L. U.

Influence of lyophilic colloids on wettability of naphthalene. A. C. CHATTERJI (Proc. Nat. Acad. Sci. India, 1936, 6, 343—347; cf. A., 1934, 23).—The wetting power of aq. solutions of lyophilic colloids for powdered C_{10}H_8 is in the order: gelatin > casein > wheat starch, agar > silicic acid. This is also the order of their protective action on Au sols.

F. L. U.

Influence of iron salts on the colour and physico-chemical properties of gelatin. M. A. CHENOCH (J. Appl. Chem. Russ., 1937, 10, 671—675).—The colour of gelatin is affected by the presence of >0.2 p.p.m. of Fe, to an extent $\propto [\text{Fe}]$. The surface tension of, and the stability of the foams formed from, gelatin solutions are raised, but the η

is unaffected, by traces of FeCl_3 . Photographic emulsions prepared from gelatin containing 0.6 p.p.m. of Fe are of inferior quality to those obtained with Fe-free gelatin.

R. T.

Thixotropy of suspensions of a Japanese hydrogynous clay. B. TAMAMUSHI (Kolloid-Z., 1937, 79, 309—314).—The existence of an optimal concn. of NaCl in inducing gelatinisation of a suspension of the clay indicates behaviour represented by: $\text{H-clay} + \text{NaCl} \rightleftharpoons \text{Na-clay} + \text{HCl}$. This is confirmed by measurements of the acidity of the ultrafiltrate. The effect of alkali and alkaline-earth cations on the thixotropy of the clay increases with the degree of hydration of the cation. The clay closely resembles bentonite both in composition and in thixotropic behaviour.

F. L. U.

Capacity [of liquids] for being spun. R. K. SCHOFIELD and G. W. S. BLAIR (Kolloid-Z., 1937, 79, 308).—The behaviour of a specimen of thixotropic honey which could be drawn into threads suggests the presence of a structural network in liquids capable of being spun. Such a structure would prevent the segmentation which would otherwise result from the operation of surface forces.

F. L. U.

Comparative electrochemical study of highly purified lyophilic sols. IV. Constitutive basis of electrochemical peculiarities of very pure acidoid sols of vegetable gums. W. PAULI, W. KÖLBL, and A. LINSKER (Kolloid-Z., 1937, 79, 273—286; cf. this vol., 303).—Conductivity (κ)-temp. curves for lactic (I), lactic + lactic (II), d -gluconic (III), and d -glycuronic (IV) acids have been determined, and compared with those given by highly purified acidoid gum arabic (V) sols. The curves given by (II) and (III), but not by (I) and (IV), resemble those for (V) in showing a max., and in being irreversible. Further, the apparent dissociation const. of (II), (III), and (V) increases with increasing concn., that of (I) and (IV) being independent of concn. The observed relations are discussed with reference to the constitution of the respective substances.

F. L. U.

Periodic precipitation in absence of foreign gel. I. Ferric hydroxide sol. R. N. MITTRA (Proc. Nat. Acad. Sci. India, 1936, 6, 321—332).—The conditions determining the periodic pptn. of $\text{Fe}(\text{OH})_3$ from a sol (cf. A., 1933, 224) have been studied when KCl and NaBrO₃ are used as coagulants.

F. L. U.

Liesegang rings and influence of media in their formation. B. N. DESAI (Current Sci., 1937, 5, 584—585).—A theoretical discussion.

F. L. U.

Swelling measurements on polymeric homologues of the cellulose nitrates. G. V. SCHULZ (Naturwiss., 1937, 25, 346—347).—Cellulose nitrates of mol. wt. 443,000, 370,000, 183,000, and 132,000 in COMe_2 have been investigated. The connexion between swelling pressure (and hence v.p. lowering) and wt. of solvent is independent of the mol. wt. of the nitrate. The v.p. of the swollen gel is not dependent on mol. concn., but on the ratio of the masses of solute and solvent. Under these circumstances, the swelling is mol. and not capillary. Up

to a swelling pressure of 20 atm., the equation, $p = ks^n$ (p = swelling pressure, s = sp. swelling vol., k and n are consts.) holds. The vals. of the consts. k and n are in agreement with those derived from osmotic determinations (cf. A., 1936, 1338).

A. J. M.

Theory of electrocapillarity. IV. Electrophoresis. S. R. CRAXFORD, O. GATTY, and H. A. C. MCKAY (Phil. Mag., 1937, [vii], 23, 1079—1082; cf. A., 1935, 698).—The electrophoretic force on electrically conducting particles in completely polarisable interphases depends only on the particle charge and the potential gradient causing electrophoresis.

F. J. L.

Equilibrium dehydrogenation of *n*-butylenes to butadiene, $n\text{-C}_4\text{H}_8 \rightleftharpoons \text{C}_4\text{H}_6 + \text{H}_2$. M. I. DEMENTJEVA, A. V. FROST, and E. K. SEREBRIAKOVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 141—143).—The decomp. of C_4H_8 to C_4H_6 and H_2 has been observed at 404—807° using Cr_2O_3 as catalyst. Equilibrium is not established at <480°, and at >540° polymerisation occurs. Vals. of $K_p = p_{\text{H}_2} \cdot p_{\text{C}_4\text{H}_6} / p_{\text{C}_4\text{H}_8}$ vary considerably according to $\log K_p = -6413/T + 6.63 \pm 0.13$; the heat of reaction is -29 ± 10 —12 kg.-cal. per mol., which agrees with thermal data.

R. S. B.

Ethyl alcohol-ethyl acetate and acetic acid-ethyl acetate systems. Vapour-liquid equilibrium data. C. C. FURNAS and W. B. LEIGHTON (Ind. Eng. Chem., 1937, 29, 709—710).—The relations between the liquid and vapour phases have been studied with the Othmer apparatus (A., 1928, 943). The const.-boiling mixture of EtOH and EtOAc contains 46.2% of EtOH, in good agreement with published results.

R. C. M.

Influence of colloids and electrolytes on the equilibrium under the action of maltase.—See A., III., 313.

Electrolyte and solvents. P. WALDEN (Trav. Congr. Jubil. Mendeleév, 1936, 1, 493—512).—A lecture. Electrolytic dissociation is discussed from the viewpoint of the composition of solute and solvent.

J. W. S.

Theory of activity coefficient for strong electrolytes in concentrated solution. I. S. ABÉ (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 370—382).—A virial equation for osmotic pressure and a corresponding equation for the activity coeff. are deduced for strong electrolytes. Agreement with experiment is shown by HCl, NaCl, CaCl_2 , and ZnSO_4 up to the most conc. solutions, and reasonable vals. of ionic diameter may be calc.

R. S. B.

Ionisation constant of α -crotonic acid at 25° from conductance measurements. B. SEXTON and G. W. WATERS (J. Amer. Chem. Soc., 1937, 59, 1048—1049).—The val. obtained is 1.975×10^{-5} .

E. S. H.

Dissociation constant of *trans*-crotonic acid at 25°. A. I. VOGEL and G. H. JEFFERY (Chem. and Ind., 1937, 56, 600).—Vals. for $K = 1.975 \times 10^{-5}$ and Δ_0 (Na salt) = 83.30 are compared with vals. obtained by Sexton and Waters (see above) and by Ives *et al.* (cf. A., 1933, 780).

C. R. H.

Chemical constitution and dissociation constants of monocarboxylic acids. VI. (a) Polarity of vinyl and phenyl groups. (b) Apparent linear relationship between dissociation constants and dipole moments. J. F. J. DIRRY and R. H. LEWIS (J.C.S., 1937, 1008—1013; cf. A., 1936, 797).—Dissociation consts. (K) (classical and thermodynamic) and mobilities have been determined at 25° for the following acids in aq. solution: *p*-tolylacetic, $\text{Ph}[\text{CH}_2]_2\text{CO}_2\text{H}$, $\text{Ph}[\text{CH}_2]_3\text{CO}_2\text{H}$, *cis*- and *trans*-cinnamic, cinnamylideneacetic, acrylic, vinyl- and allyl-acetic. In all cases K decreases with increasing distance of Ph or CH_2CH from the CO_2H , and is interpreted on the basis of a combination of polarisability and permanent polarisation effects. A marked "steric" effect is observable with *cis*-cinnamic acid, the K val. (13.2×10^{-5}) for which is that (3.65×10^{-5}) for the *trans*-acid. A nearly linear relationship exists between the K vals. and dipole moments of BzOH and its Me , mono-methoxy-, -halogen-, and -nitro-derivatives, and between those of $\text{CH}_2\text{PhCO}_2\text{H}$ and its corresponding derivatives.

F. L. U.

Ionic dissociation of alkyl halides. A. TIAN and É. GAND (Compt. rend., 1937, 204, 1811—1813).—The electrical conductivity of H_2O is increased immediately on addition of RI ($\text{R} = \text{Me}$, Et, or Pr^n). The I is pptd. completely by aq. AgNO_3 in 2 hr. and the solution remaining contains free acid, ROH, and RNO_3 . The hydrolysis of RI being very slow, these results are explained by assuming that it behaves as a weak electrolyte in aq. solution.

A. J. E. W.

The glutamic acid-pyrrolidonecarboxylic acid system. H. WILSON and R. K. CANNAN (J. Biol. Chem., 1937, 119, 309—331).—Equilibrium consts. and velocity coeffs. for this system have been determined over the p_{H} range -0.28 to $+13.38$ and at 100°, 78°, and 118°. The dissociation consts. of glutamic acid are $pK_1 = 2.19$, $pK_2 = 4.32$, $pK_3 = 9.94$, and of pyrrolidonecarboxylic acid 3.32 (cf. A., 1927, ii, 9). The effect of varying $[\text{KCl}]$ on the dissociation consts. has also been investigated. The mechanism of the reaction and its use in the routine of protein analysis are discussed.

J. W. S.

Exchange of charge between thallos and thallic ions. V. MAJER (Z. physikal. Chem., 1937, 179, 51—60; cf. A., 1936, 918).—Using Th- C'' as radioactive indicator it has been shown that in strongly acid nitrate solution there is free exchange, for the Th- C'' is shared equally between the Th^{I} and Th^{III} salts. In neutral and weakly acid solutions of the nitrates and in solutions of the chlorides more Th- C'' goes to the Th^{I} than to the Th^{III} salt, an effect which seems to be due to hydrolysis of the $\text{Th}(\text{NO}_3)_3$, as a result of which some of the Th^{III} ions are unable to participate in the exchange of charge.

R. C.

Determination of the hydration of the ions of sodium iodide. F. BOURION and (Mlle.) O. HUN (Compt. rend., 1937, 204, 1872—1873).—Cryoscopic methods for determining the hydration of ions (A., 1936, 797; this vol., 362) have been applied to M and 0.5 M solutions of NaI. In 0.5 M solution, NaI, Na^+ , and I^- are associated with 14.5, 11.1, and 3.4 mols. H_2O , respectively.

W. R. A.

Ionic potential and basic and acidic properties of hydroxides. C. E. SUN (J. Chinese Chem. Soc., 1937, 5, 148—153).—Recent data show that cations in aq. solution are basic, amphoteric, or acidic according as the ionic potential is <6 , approx. 6, or >6 (cf. A., 1929, 269). J. G. A. G.

Fusion diagram for two components giving a eutectic and solid solutions, taking into consideration the degree of dispersion. L. V. NIKITIN (J. Gen. Chem. Russ., 1937, 7, 977—979).—Theoretical. R. T.

M.-p. diagrams of binary systems of condensed gases. H. VEITH and E. SCHRODER (Z. physikal. Chem., 1937, 179, 16—22).—The systems $\text{Kr}-\text{CH}_4$, $\text{A}-\text{CH}_4$, and $\text{A}-\text{Kr}$ are characterised by complete miscibility in the solid state, although $\text{A}-\text{CH}_4$ at lower temp. and high A concns. affords evidence of separation into two solid phases. In the system $\text{A}-\text{O}_2$ there is a miscibility gap between 79 and 90 mol.-% O_2 , and the mixture with 90% O_2 is a peritectic. R. C.

System $\text{PbO}-\text{B}_2\text{O}_3$. R. F. GELLER and E. N. BUNTING (J. Res. Nat. Bur. Stand., 1937, 18, 585—593).—The following compounds have been identified: $4\text{PbO} \cdot \text{B}_2\text{O}_3$, two forms, congruent m.p. 565° ; $2\text{PbO} \cdot \text{B}_2\text{O}_3$, two forms, incongruent m.p. 497° ; $5\text{PbO} \cdot 4\text{B}_2\text{O}_3$, incongruent m.p. 548° ; $\text{PbO} \cdot 2\text{B}_2\text{O}_3$, congruent m.p. 768° . An additional cryst. phase could not be identified. Optical data are recorded. The eutectic (PbO 88%) corresponds with the min. m.p. (493°). H. J. E.

Calcined mixtures of litharge and titanium dioxide. X-Ray diffraction study. D. G. NICHOLSON (Ind. Eng. Chem., 1937, 29, 716—717; cf. B., 1936, 336).— $\text{PbO} \cdot \text{TiO}_2$ is the only compound formed at $680-700^\circ$ in mixtures of PbO (uncalcined) and TiO_2 (calcined) when the PbO/TiO_2 ratio is varied from 20 to 0.05. R. C. M.

Binary systems of alkali nitrates. N. A. PUSHIN and M. RADOICIC (Z. anorg. Chem., 1937, 233, 41—46).—Cooling curve data are recorded for: $\text{KNO}_3-\text{RbNO}_3$ (continuous range of solid solutions); $\text{NaNO}_3-\text{RbNO}_3$ (eutectic 178.5° , 55 mol.-% RbNO_3); $\text{LiNO}_3-\text{RbNO}_3$ (equimol. compound m.p. 191° , eutectics 179.5° , 35 mol.-% RbNO_3 and 154° , 68 mol.-% RbNO_3); $\text{CsNO}_3-\text{LiNO}_3$ (eutectic 174° , 57 mol.-% LiNO_3); $\text{CsNO}_3-\text{Pb}(\text{NO}_3)_2$ [up to 50 mol.-% $\text{Pb}(\text{NO}_3)_2$; eutectic 176° , 32 mol.-% $\text{Pb}(\text{NO}_3)_2$]. F. J. G.

Thermal decomposition of barium carbonates. L. HACKSPILL and G. WOLF (Compt. rend., 1937, 204, 1820—1822).—The dissociation pressure of BaCO_3 has been measured between 700° and 1250° . An allotropic transformation occurs at 910° , and the $\text{BaO}-\text{BaCO}_3$ eutectic melts at about 1100° . No basic carbonate could be identified by X-ray analysis. A. J. E. W.

Vapour pressure-temperature relations of the binary system zinc nitrate-water. W. W. EWING and H. M. FISHER (J. Amer. Chem. Soc., 1937, 59, 1046—1048).—V.p. for unsaturated, saturated, and

supersaturated solutions and eutectic mixtures are recorded for the concn. range 0—82% at $10-60^\circ$. E. S. H.

Rare-earth metals and their compounds. I. Binary system hexahydrated lanthanum and magnesium nitrates. L. L. QUILL and R. F. ROBEX (J. Amer. Chem. Soc., 1937, 59, 1071).—The existence of $2\text{La}(\text{NO}_3)_3 \cdot 3\text{Mg}(\text{NO}_3)_2$ is confirmed. E. S. H.

Alkali phosphates and arsenates. III. Tertiary sodium arsenates. H. MENZEL and W. HAGEN (Z. anorg. Chem., 1937, 233, 49—83).—The 20° isotherm of the system $\text{Na}_2\text{O}-\text{As}_2\text{O}_5-\text{H}_2\text{O}$ has been determined in the region from NaH_2AsO_4 up to high alkalinity. $\text{NaH}_2\text{AsO}_4 \cdot \text{H}_2\text{O}$ and $\text{Na}_2\text{HAsO}_4 \cdot 12\text{H}_2\text{O}$ form congruent solutions. In a small range of relatively acid solutions ($\text{Na} : \text{As}$ 2.3—2.5) the solid phase is the true tertiary arsenate (ortho-salt), but this passes without discontinuity into a homogeneous series of "pseudo-salts" (ψ -salts). Similar relations are found at 0° and 50° . In very conc. alkali two further solid phases appear. The ψ -salts give X-ray diagrams closely resembling that of the ortho-salt. Tensimetric curves for the ortho-salt indicated hydrates with 9, 7, and $3\text{H}_2\text{O}$, and these give characteristic X-ray diagrams. In the case of the ψ -salt, hydrates with 10 and $3.5\text{H}_2\text{O}$, possibly also 7.5 and $5.5\text{H}_2\text{O}$, are indicated. It retains traces of H_2O which cannot be removed without volatilising NaOH , but the final product gives an X-ray diagram identical with that of the anhyd. ortho-salt. This "pseudo-salt anomaly" is compared with that of Na_3PO_4 (this vol., 185) and possible explanations are discussed. F. J. G.

Complex formed by lead iodide and lithium iodide in aqueous solution. (MME.) N. DEMASSEUX and L. ROGER (Compt. rend., 1937, 204, 1818—1819; cf. A., 1923, ii, 565).—Solubility data for the system $\text{PbI}_2-\text{LiI}-\text{H}_2\text{O}$ are recorded together with vals. of d , n , and r_L for the aq. phase. $\text{PbI}_2 \cdot \text{LiI} \cdot 4\text{H}_2\text{O}$, PbI_2 , and $\text{LiI} \cdot 3\text{H}_2\text{O}$ occur as solid phases. A. J. E. W.

Three-component systems of cobalt chloride and water with calcium, strontium, or thorium chloride. H. BASSETT, H. F. GORDON, and J. H. HENSHALL (J.C.S., 1937, 971—973; cf. A., 1932, 811).—Data for the system $\text{CoCl}_2-\text{CaCl}_2-\text{H}_2\text{O}$ at 0° , 25° , and 50° are shown in a triangular diagram. The only solid phases present in the system $\text{CoCl}_2-\text{SrCl}_2-\text{H}_2\text{O}$ are the two hexahydrates at 25° and the two dihydrates at 80° . In the system $\text{CoCl}_2-\text{ThCl}_4-\text{H}_2\text{O}$ at 25° there is a large region of $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ and a small one of $\text{ThCl}_4 \cdot 8\text{H}_2\text{O}$. No double salts or solid solutions were found in any of the systems examined. Cryst. characteristics of the three forms of $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$ are described. F. L. U.

Solubility of bone salt. M. M. LOGAN and H. L. TAYLOR (J. Biol. Chem., 1937, 119, 293—307).—The ionic product $[\text{Ca}^{++}][\text{PO}_4^{---}]^2$ for a solution of p_H 7.4 and containing initially CaCl_2 (0.00106M), Na_2HPO_4 (0.00306M), NaHCO_3 (0.025M), and NaCl (0.12M), when left in contact with bone powder or with $\text{Ca}_3(\text{PO}_4)_2$ for 8 days, increases as the amount of solid in contact with the solution decreases below

0.150 g. per litre. The solubility product, expressed as $p[\text{Ca}^{++}][\text{PO}_4^{---}]^2$, is 23.1 ± 0.4 . It is inferred that bone salts cannot ppt. spontaneously from blood plasma unless the ion product is increased, and when once formed cannot dissolve unless the $[\text{Ca}^{++}]$ and $[\text{PO}_4^{---}]$ fall below the concns. found in blood plasma. It would seem that the metabolic activity of cells is necessary for both the pptn. and dissolution of the Ca salts. J. W. S.

Solid-liquid phase equilibria in ternary organic systems. XV. The system carbamido-urethane-phenacetin. K. HRYNAKOWSKI and F. ADAMANIS (Rocz. Chem., 1937, 17, 132—139).—The eu- and peri-ectic mixtures are described.

R. T.

System copper-iron-sulphur. H. E. MERWIN and R. H. LOMBARD (Econ. Geol., 1937, 32, Suppl. to No. 2, 203—284).—Powdered mixtures of Cu_2S and FeS absorb S when heated in S vapour at higher pressures. S-rich solid solutions $\text{Cu}_2(\text{Fe})\text{S}_{1+}$ (chalcocites) and $\text{Fe}(\text{Cu}_2)\text{S}_{1+}$ (pyrrhotites) are first formed, followed by the production of five ternary compounds, all of which tend to form solid solutions, and finally by the formation of covellite, CuS , and pyrite, FeS_2 , which have no appreciable tendency to form solid solutions and are stable even in saturated S vapour over a wide range. Two of the ternary compounds, Cu_5FeS_6 and $\text{Cu}_3\text{Fe}_4\text{S}_6$ (?), are new. Measurements of the S v.p. have been made for some of the systems involved and dissociation pressure curves for Cu_5FeS_6 , Cu_5FeS_4 (bornite), CuFe_2S_3 (cubanite), and $\text{CuFeS}_{1.94}$ (chaleopyrite solid solution) have been determined. The system is described in detail for a S v.p. of 455 mm. and data for certain other temp. and pressures are given. Phase changes occurring in the solid state during cooling are also discussed. L. S. T.

Iron corner in the ternary system iron-vanadium-carbon. F. WEVER, A. ROSE, and H. EGGERS (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 14, 239—246).—Equilibria have been determined by thermal analysis and micrographic examination.

E. S. H.

Behaviour of melts of iron, nickel, and manganese towards their liquid silicates and solid silicic acid at 1600°. W. OELSEN and G. KREMER (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 89—107).—Equilibria in the three-phase system metal layer-silicate slag-solid SiO_2 have been determined for the components Fe-Ni-Mn-Si-O at 1600—1650°.

E. S. H.

Effect of silicide, phosphide, and carbide formation in iron melts on their equilibria with oxides. F. KORBBER and W. OELSEN (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1936, 18, 109—130).—The heats of formation of Fe-Si alloys have been determined. The influence of Si, P, and C on the equilibrium in the system Fe-Mn-Si-O has been studied at $\leq 1600^\circ$; the displacement of the metal-slag equilibrium in the system is compared with the displacement of the solubility limit of graphite in Fe melts by P and C. E. S. H.

Heats of dissolution of hydrogen chloride and bromide. W. A. ROTH and A. BERTRAM (Z.

Elektrochem., 1937, 43, 376—378).—Data are recorded for different dilutions at 20°. At infinite dilution the estimated vals. are +17.45 to 17.50 and +16.0 kg.-cal. for HCl and HBr, respectively.

E. S. H.

Dissociation energy of carbon monoxide. R. SCHMID (Roy. Hung. Palatin-Joseph Univ., Publ. Dept. Min. Met., 1935, 7, 171—182; cf. A., 1935, 1299).—The heat of sublimation of solid C = 108 kg.-cal. and λ = 205 kg.-cal. The C-C bond energy is 102 kg.-cal. for solid C and 99 kg.-cal. for aliphatic C compounds. The ionisation potential for CO CO^+ = 13.15 volts. The val. $D(\text{CO})$ = 8.4 volts needs confirmation. CH. ABS. (e)

Heat of formation of hydrocarbons. M. BRUTZCUS (Compt. rend., 1937, 204, 1802—1804; cf. this vol., 223, 309, 364).—The relations between the heat of formation of a hydrocarbon and the energy vals. of its linkings are discussed.

A. J. E. W.

Phase equilibria in hydrocarbon systems. XVIII. **Thermodynamic properties of ethane.** B. H. SAGE, D. C. WEBSTER, and W. N. LACEY (Ind. Eng. Chem., 1937, 29, 658—666).—Sp. vol., Joule-Thomson coeff., and isochoric sp. heats have been determined for C_2H_6 . From these and other primary data, vals. of heat content and entropy have been calc. for a series of temp. from 20° to 120° and at pressures from atm. to 3500 lb. per sq. in. Several diagrams are given illustrating the thermodynamic behaviour of C_2H_6 . H. C. M.

Heats of hydrogenation of unsaturated esters. E. SCHJANBERG (Z. physikal. Chem., 1937, 179, 39—42).—Calculation of the heats of hydrogenation, Q , of crotonic and pentenoic esters has shown that only when the C:C linking is in the $\gamma\delta$ -position in the acyl radical is Q equal to the val. for C_2H_4 . Hiltner's methods and results (A., 1932, 341) are criticised.

R. C.

Heat of combustion and structure of cuprene. P. J. FLORY (J. Amer. Chem. Soc., 1937, 59, 1149—1150).—The val. 267 kg.-cal. per structural unit $-\text{C}_2\text{H}_2-$ is calc. from published data. E. S. H.

Properties of polymerides in solution. IV. **Free energy and heat of formation. Solutions of butyl valerate and sebacate.** C. G. BOISSONNAS. V. **Measurement of vapour pressure.** C. G. BOISSONNAS and A. J. VAN DER WYK. VI. **Free energy and heat of dissolution. System cellulose nitrate-cyclohexanone.** C. G. BOISSONNAS and K. H. MEYER (Helv. Chim. Acta, 1937, 20, 768—779, 779—782, 783—790).—IV. The heat changes in the formation of binary mixtures of the two esters with C_6H_6 and Pr^nBr have been determined calorimetrically and compared with vals. for the free energy obtained by Bronsted and Colmant (cf. A., 1934, 844). The entropy of formation is in each case $>$ for ideal "mixing, although the difference is small for the system $\text{Bu}^n\text{CO}_2\text{Bu}^n-\text{Pr}^n\text{Br}$. The difference increases with increase in the val. of the ratio mol. vol. ester/mol. vol. solvent.

V. An apparatus is described for the rapid measurement of v.p. in equilibrium with a solution which can

be in the form either of a liquid or a gel. Measurements can be made with < 0.1 g. of substance.

VI. From data for the v.p. and osmotic pressure of solutions of cellulose nitrate (I) in *cyclohexanone* at 25° and 36° , the free energies of dilution have been calc. For solutions containing 0–70% of (I) the free energy of dilution can be represented by an expression of the form $Aw + Bw^2$, where w is wt.-% (I) and A and B are consts. Applying Raoult's law, the calc. mol. wt. of (I) is of the order of 70,000. From measurements of the temp. coeff. of osmotic pressure, the heat of dilution has been calc. It is negative and is $<$ the free energy of dilution, i.e., the entropy of dilution is $>$ for "ideal" dilution. C. R. H.

Transference of water. III. Its dependence on concentration in electrolysis of barium chloride solutions. M. TAYLOR and V. R. WILLCOX (J.C.S., 1937, 902–907; cf. A., 1932, 1092).—Measurements have been made with 0.5*M*- and 0.25*M*-BaCl₂ at 25° , using CO(NH₂)₂ as a reference substance. The H₂O transported is $\frac{1}{4}$ to $\frac{1}{3}$ of the quantity obtained with NaCl solutions. In both concns. H₂O moves to the cathode, and the quantity transported changes little with concn., although the transport no. of Ba⁺⁺ increases rapidly with increasing dilution. It is suggested that the double charge produces a hydration shell which is more firmly bound than that around Na⁺ or Cl⁻.

F. L. U.

Behaviour of glass electrode at different temperatures. A. A. SMIRNOV (J. Gen. Chem. Russ., 1937, 7, 796–807).—The influence of temp. is given by $p_H - E/0.059 = b_K - 0.0025(t - t_K)$, where E is the p.d. between a HgCl electrode and the glass electrode at t° , $0 = RT/nF$, and b_K is a const. for the temp. t_K at which the glass electrode has been calibrated. Applying the general formula, p_H may be determined with an error ± 0.03 , at 24 – 60° . R. T.

Energy states of valency electrons in metals. I. 4. Nature of electrode potentials and mechanism of catalytic action of metal surface. I. 5. Threshold value of overvoltage of hydrogen on zinc electrode. M. SATO (Sci. Rep. Tohoku, 1937, 25, 829–870, 871–878; cf. A., 1936, 1316).—I (4). The normal electrode potentials for the (0001), (1010), (1120), (1011), and (1121) faces of a single Zn crystal in 0.5*N*-H₂SO₄ and 0.5*N*-ZnSO₄ have been measured; the vals. are attributed to electron transitions between certain energy levels. The potential barrier which gives rise to the electrode potential is identical with the photo-electric threshold barrier, and this is used to calculate the abs. vals. of the potential barriers of Zn and H₂ electrodes. The catalytic action of metal surfaces is due to the unstable state of some of the valency electrons in the transient surface layer.

I (5). The potential barrier at the threshold val. of the overvoltage of H on a Zn electrode is 2.684 e.v., arising from the difference between the energy vals. $E_1 - E_2$ in the Zn electrode, and the dissociation energy of H₂⁺. F. J. L.

Diffusion potentials. III. V. ČUPR. IV. V. ČUPR and K. MAREK (Publ. Fac. Sci. Univ. Masaryk, 1937, No. 234, 16 pp.; No. 237, 15 pp.).—III. A

method is described for the determination of the diffusion potential between a test solution and solutions which contain HCl, KCl, or HCl + KCl. A knowledge of the difference of the e.m.f. of cells with and without the test solution is required. A comparison of Henderson's equation applied to the case where a relatively better conducting solution is in contact with two others shows only small differences as compared with the equation of Lewis and Sargent. The latter equation is shown to hold for solutions of HCl and KCl up to a total concn. of 0.2*N*. With higher concns. there are considerable deviations.

IV. When experimental vals. for more conc. solutions of KCl + HCl with equal activities of Cl⁻ are substituted in the Lewis and Sargent equation, vals. for the diffusion potential are obtained which differ from those given by the above method. Vals. of the diffusion potential for equally conducting solutions are not const. as they should be. The equations would seem to require modification by the introduction of an unknown factor which takes account of the circumstance that the individual ions may participate differently in the conductivity and diffusion of solutions. F. R.

Diffusion of an electrolyte. I. Theoretical.

II. Experimental. J. J. HERMANS (Rec. trav. chim., 1937, 56, 635–657, 658–672).—I. Expressions are derived for the diffusion coeff. and diffusion potential, L . The equation for L agrees satisfactorily with recorded data for solutions of HCl, NaCl, and BaCl₂ at concns. > 0.03 , 0.03, and 0.01 g.-mol. per litre, respectively, the vals. being respectively $<$, approx. $=$, and $>$ the vals. calc. from Nernst's theory. In the case of NaCl the electrophoretic and electrostatic terms in the author's equation are of similar magnitude and almost cancel each other.

II. New measurements of L for solutions of NaCl at 18° and BaCl₂ at 25° support the author's theory. Data for HCl in a H₂O–EtOH mixture containing 40 mol.-% EtOH agree with theory at concns. > 0.009 g.-mol. per litre. The smaller range of validity of the equation for EtOH–H₂O solutions as compared with aq. solutions is ascribed to the lower dielectric const. of the former solvent. The equiv. conductivity and transport no. of HCl in EtOH–H₂O solutions have been determined. C. R. H.

Polarographic studies with the dropping mercury cathode. LXVIII. Hydrogen overpotential in light and heavy water. J. NOVAK (Coll. Czech. Chem. Comm., 1937, 9, 207–237).—The inflexion points on the current-voltage curves due to the deposition of hydriens at the dropping Hg cathode in 99.6% D₂O (I) at 20° and 60° are negative to the extent of 87 and 71 mv., respectively, with respect to the vals. in H₂O. The factor b of the $b \log i$ term of the overvoltage relation is 113 mv. in (I) and 102 mv. in H₂O at 20° , and increases less rapidly than is required by the linear relation with T . The electrode potential of 1% Tl–Hg in (I) is 3 mv. $>$ in H₂O, and the potential of electroreduction, π , of maleic acid in 0.1*N*-HCl in (I) is 13 mv. $>$ in H₂O (cf. A., 1935, 1079). The π of O₂ to H₂O₂ in 0.1*N*-K₂CO₃ is the same in H₂O as in (I), but the π

of H_2O_2 to H_2O in (I) is 84 mv. negative with respect to that in H_2O (cf. A., 1930, 304; 1935, 1208).

J. G. A. G.

D. Mendeleev and the phenomena of contact. N. D. ZELINSKI (Trav. Congr. Jubil. Mendeléev, 1936, 1, 629—638).—A lecture. Conditions occurring at interfaces and their significance in contact catalysis are discussed.

J. W. S.

Flow potentials on platinum. H. R. KRUYT and J. OOSTERMAN (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 404—406) Preliminary. It is impossible to determine the electrokinetic potential of Pt accurately by flow potential measurements; owing to wall conductivity, the ends of the capillary become polarised to H_2 and O_2 electrodes and the measured e.m.f. is determined by the p.d. of these electrodes.

O. D. S.

Influence of ammonium molybdate on acidity of sugar solutions. M. NICULESCU (J. pr. Chem., 1937, [ii], 148, 289—294).—The acidity of aq. $(\text{NH}_4)_2\text{MoO}_4$ is increased by addition of arabinose, glucose, fructose, galactose, lactose, maltose, and sucrose. The formation of complexes is inferred.

F. L. U.

Molecular resonance systems. III. Indicator properties of some anilinesulphonaphthaleins. G. SCHWARZENBACH and G. H. OTT (Helv. Chim. Acta, 1937, 20, 627—633).—Equilibrium consts. and transition points for a no. of substituted anilinesulphonaphthaleins have been determined. The influence of substituents and the magnitude of salt errors are discussed.

C. R. H.

Electrolytic reduction potentials of organic compounds. XII. Reduction potentials of p-aminoazobenzene. M. SHIKATA and I. TACHI. XIII. Reduction potentials of dimethylaminoazobenzene. I. TACHI (Mem. Coll. Agric. Kyoto, 1937, No. 40, 1—10, 11—20).—See A., 1933, 1121, 1122.

J. W. S.

Oxidation-reduction potentials measured with the dropping mercury electrode. I. Studies with quinhydrone and determination of limits of measurement. II. Polarographic investigation. New method. O. H. MÜLLER and J. P. BAUMBERGER (Trans. Electrochem. Soc., 1937, 71, Preprints 34 and 35, 459—470, 471—484).—I. The upper limit of potential depends on the presence of ions which form ppts. with Hg^{2+} , and can be calc. if the concn. and solubility product of the ions are known. When the concn. of ions is $<10^{-5}M$ the potential is not affected. The dropping Hg electrode can be used for determining oxidation-reduction potentials from the upper limit down to potentials $<$ that of the H_2 electrode. Experiments with quinhydrone in buffered solutions of p_H 2—8 are described.

II. The determination of oxidation-reduction potential in org. systems from a single polarographic curve is described. The approx. concns. and the ratio of oxidant to reductant can be read from the same curve. Results for several org. systems are recorded. The existence of semiquinones is demonstrated and the potentials characterising the two steps in their oxidation have been determined.

E. S. H.

Anodic polarisation of tungsten. J. P. E. DUCLAUX (Compt. rend., 1937, 204, 1633—1635).—The electrolysis of H_2SO_4 has been studied with a W anode which had been (a) polished and (b) subjected to anodic polarisation in aq. NH_3 . A layer of high resistance forms on the anode and causes the current to decrease.

R. S. B.

Passivity of iron and steel in nitric acid solution. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 299—342).—Mg, Sn, Pb, and Al are electronegative, and Cu, Ag, Mo, W, Au, Pt, and C are electropositive, to Fe in HNO_3 . Ni is electropositive or electronegative according to whether $[\text{HNO}_3]$ is $<$ or $> 25\%$. Passivity is prevented when Fe is in contact with Ni or Cu, and is accelerated when in contact with Ag, W, Mo, or C. The influence of the other metals is not so great.

C. R. H.

Influence of ultrasonic waves on the passivity of metals. G. SCHMID and L. EHRET (Z. Elektrochem., 1937, 43, 408—415).—The action of ultrasonic waves destroys the passivity of Fe or Cr in HNO_3 or of Pb anodes in aq. Na_2CO_3 , but favours the formation of anodic films on Al and the passivation of a Ni anode in aq. $\text{Na}_2\text{SO}_4 + \text{H}_2\text{SO}_4$.

E. S. H.

Two-step oxidation treated for the case of phenanthraquinonesulphonate. L. MICHAELIS and M. P. SCHUBERT (J. Biol. Chem., 1937, 119, 133—140).—K phenanthraquinone-2- and 3-sulphonates (prepared by oxidation of the corresponding phenanthrenesulphonates by CrO_3 in glacial AcOH), when suspended in EtOH to which conc. aq. NaOH (5%) has been added, yield green rhombic plates of the semiquinones (I), which potentiometric measurements show to be acids slightly stronger than the quinols. The max. fraction of (I) which can exist in very alkaline solutions is 0.67. Contrary to the indication of potential curves, however, these can exist at $p_H < 6$. The significance of inflexion points in potentiometric titration curves is discussed.

J. W. S.

Influence of concentration of indifferent electrolyte on the magnitude of the diffusion current of the cation under analysis. J. P. GOCHSCHEIN (J. Gen. Chem. Russ., 1937, 7, 789—795).—The height of the wave obtained in the polarographic determination of Zn falls to a min. and then rises, with increasing concn. of indifferent electrolyte (LaCl_3 , BaCl_2 , KI).

R. T.

Potential gradient of gelatin under tension. (MLLE.) S. VEIL (Compt. rend., 1937, 204, 1645—1646).—The variation with time of the potential gradient in gelatin with electrodes 8 cm. apart and a p.d. of 2 volts has been determined.

R. S. B.

Affinity. J. E. VERSCHAFFELT (Wis.-nat. Tijdschr., 1935, 7, 203—216; Chem. Zentr., 1936, i, 3259).—Theoretical. Affinity is treated as the rate of change dQ'/dw of uncompensated heat of reaction Q' with degree of reaction w .

J. S. A.

Bimolecular association reactions. G. E. KIMBALL (J. Chem. Physics, 1937, 5, 310—313).—The mean life-time of an unstable mol. formed by the association of two polyat. radicals can be calc. by classical methods by assuming that all the energy of

formation is stored up mainly as vibrational energy in the unstable intermediate complex. This period, which is usually long in comparison with the time between collisions, determines the order of a gaseous reaction. Approx. vals. for certain unstable mols. are given and the kinetic order of the reaction is determined from them. W. R. A.

Displacement law of maximum velocity of bimolecular heterogeneous reactions. D. REICHSTEIN (Helv. Chim. Acta, 1937, 20, 644—647).—A graphical method correlating adsorption velocity with the amount of substance adsorbed and its concn. in the external space is applied to the theoretical examination of the problem. C. R. H.

Steady-state rate of a chain reaction for the case of chain destruction at walls of varying efficiencies. G. VON ELBE and B. LEWIS (J. Amer. Chem. Soc., 1937, 59, 970—975).—Theoretical. The cases of chain initiation at the wall and in the gaseous phase are considered. With negligible branching there exist characteristic relations between rate and vessel diameter, which may be used for the kinetic study of the unbranched reaction, whereas the branching reaction may be studied from explosion limits. The influence of vessel diameter on rate is described quantitatively for varying chain-breaking efficiencies. E. S. H.

Reactions in the system containing nitrogen dioxide, carbon monoxide, and oxygen; NO₂ as an intermediate in the classical termolecular oxidation of nitric oxide. G. M. CALHOUN and R. H. CRIST (J. Chem. Physics, 1937, 5, 301—309).—The kinetics of some reactions in the system containing NO₂, O₂, and CO have been studied from 658° to 800 abs. The reaction is heterogeneous at low NO₂ pressures, but becomes homogeneous above 10 mm. The homogeneous oxidation of NO has been investigated at low p_{O₂} and const. p_{NO} and p_{CO} and the corresponding bimol. coeffs. determined over a range of temp. These do not show a linear logarithmic variation with respect to 1/T, and this is attributed to an increase in the energy of activation. The oxidation of CO in the system appears to proceed by means of either NO₂ or NO₃. The improbable termol. order previously observed in the oxidation of NO is attributed to two consecutive bimol. reactions also involving either NO₂ or NO₃. W. R. A.

Combustion of paraffin hydrocarbons. G. VON ELBE and B. LEWIS (J. Amer. Chem. Soc., 1937, 59, 976—984).—Theoretical. The concepts of "peroxide branching" operating at low temp. and of "peracid branching" at high temp. are described. The mechanisms of primary aldehyde-forming reactions and secondary non-chain reactions are discussed. E. S. H.

Spontaneous ignition of hydrocarbon-air mixtures. C. R. KENT (J. Proc. Australian Chem. Inst., 1937, 4, 179—190).—A summary of results published by Townend and co-workers (cf. A., 1936, 801, etc.). J. G. A. G.

Homogeneous first-order gas reactions. VI. Decomposition of methylene diacetate, methylene dipropionate, and methylene dibutyrate.

C. C. COFFIN and W. B. BEAZLEY (Canad. J. Res., 1937, 15, B, 229—236).—The thermal decomp. of methylene diacetate (I) vapour between 220° and 305° and at pressures ranging from several cm. to several atm. is homogeneous and of first order. It is opposed by a second-order recombination of CH₂O and COMe₂ which prevents the exact determination of the equilibrium. The rate of reaction was investigated by analytical and by pressure change methods. Methylene dipropionate and dibutyrate decompose at the same rate as (I) and the energies of activation are identical, in agreement with the view that the extent to which a radical can influence the energy of activation is dependent on its position in the mol. W. R. A.

Rate of homogeneous thermal decomposition of acetaldehyde in the gaseous phase. M. LETORT (J. Chim. phys., 1937, 34, 265—320).—Full details are given of work previously summarised (A., 1936, 707; 1934, 1073). The rate of decomp. of 32—443 mm. of MeCHO at 473—578° is given approx. by $-dc/dt = k_0 c_0^{-0.5} c^2$, where c_0 is the initial concn., c is the concn. at time t , and $\log k_0 = 12.647 - 46,000/2.3026RT$ (units: min., g.-mol., litre); the observed initial velocities, v_0 , conform very closely to $v_0 = k_0 c_0^{1.5}$. The energy of activation is 46 ± 0.6 kg.-cal. and is independent of [MeCHO] (cf. A., 1933, 910). The results are discussed with reference to earlier work. J. G. A. G.

Thermal polymerisation of styrene. H. DOSTAL and W. JORDE (Z. physikal. Chem., 1937, 179, 23—31).—The course of the reaction at various temp. and concns. is the same in vessels of varying kinds of glass. O₂ accelerates the reaction. It seems either that the chain-breaking reaction is heterogeneous or that several reactions of differing orders occur at once. The period of induction varies in length and may be absent. R. C.

Kinetics of the thermal polymerisation of styrene in solution. H. SUESS, K. PILCH, and H. RUDORFER (Österr. Chem.-Ztg., 1937, 40, 287—288; cf. this vol., 249).—The polymerisation of styrene in PhMe, PhCl, and CCl₄ solution has been studied at 80°, 100°, and 120°. J. W. S.

Isotope exchange in water and deuterium oxide. H. ERLÉNMEYER, W. SCHOENAUER, and G. SCHWARZENBACH (Helv. Chim. Acta, 1937, 20, 726—732).—K succinate, KOAc, and anhyd. H₃PO₂ dissolved in D₂O and maintained at room temp. underwent isotope exchange to the extent of 0.042, 0.25, and 2.4 H atoms per mol., respectively. Ba(D₂PO₂)₂, prepared by dissolving BaO in D₂O and treating the Ba(OD)₂ with white P in a N₂ atm., did not undergo isotope exchange in contact with H₂O for several hr. The results are discussed with reference to the relation between exchange velocity and dissociation const. C. R. H.

Rate of alkaline hydrolysis of pentenoic esters. E. SCHJÄNBERG (Z. physikal. Chem., 1937, 179, 32—38).—The rate of hydrolysis, v , of certain pentenoic and valeric esters has been determined. With the esters of $\beta\gamma$ - and $\gamma\delta$ -unsaturated acids v runs parallel with the dissociation const. of the acid, K . For esters of $\alpha\beta$ -unsaturated acids v is $<$ for the esters of the

corresponding saturated acids, but constitutive effects obscure any relation between v and K . The activation energy, q , and action const., α , of the esters of *sec.* alcohols vary with temp. A double linking at $\alpha\beta$ in the acyl radical raises q , but at $\beta\gamma$ it depresses q and at $\gamma\delta$ has very little effect. R. C.

Reaction between phthalic anhydride and ethylene glycol. A. N. KOGAN (J. Appl. Chem. Russ., 1937, 10, 900—907).—The velocity of the reaction corresponds with that of a bimol. reaction. The closest agreement between the calc. and the experimental vals. of the sap. vals. of the products is found when the substrates are taken in equimol. proportions, and the rate of increase of the mol. wt. of the resins formed is the greatest for such mixtures. Evidence of reaction between OH groups is obtained in the case of mixtures containing excess of glycol. R. T.

Reactions in concentrated sulphuric acid. II. Influence of gases. J. MILBAUER (Chem. Obzor, 1935, 10, 201—204; Chem. Zentr., 1936, i, 3489).—The combustion of sucrose, citric acid, and phloroglucinol in H_2SO_4 in streams of N_2 , CO_2 , SO_2 , and O_2 has been studied and the concn. of SO_2 in the issuing gases measured; the evolution of SO_2 is fastest with O_2 . 100 c.c. of 90.8% H_2SO_4 dissolve 0.446 g. of SO_2 at 100° and 0.04 g. at 237° . H. N. R.

Mechanism of substitution reactions: reaction of benzyl chloride with mercuric salts. I. ROBERTS and L. P. HAMMETT (J. Amer. Chem. Soc., 1937, 59, 1063—1070).—The kinetics of the reaction and the distribution between the major products, $\text{CH}_2\text{Ph}\cdot\text{NO}_3$ and $\text{CH}_2\text{Ph}\cdot\text{OH}$, have been studied in dioxan- H_2O mixtures. The influence of added NO_3^- , ClO_4^- , and HgCl_2 and the kinetic complications due to a slow secondary reaction have been investigated. A two-step mechanism involving non-ionised $\text{Hg}(\text{NO}_3)_2$ as principal reactant and CH_2Ph^+ as an intermediate is discussed. E. S. H.

Kinetics of the sulphuric acid condensation of o-benzoylbenzoic acid.—See A., II, 294.

Mechanism of hydrolysis and alcoholysis of alkyl halides: reactions of methyl, ethyl, and tert.-butyl bromides with aqueous ethyl alcohol. W. TAYLOR (J.C.S., 1937, 992—993).—Contrary to the theory of Hughes and Ingold (A., 1935, 452), both MeBr and EtBr show unimol. hydrolysis in aq. EtOH, and the velocities of hydrolysis of alkyl bromides follow the order $\text{Bu}^t\text{Br} \gg \text{MeBr} > \text{Pr}^i\text{Br} > \text{EtBr}$. This suggests that the min. velocities of reaction of alcohols or acetates with HBr observed at Et may be due not to a change of mechanism from unimol. to bimol., but to the varying nature of the alkyl group. J. W. S.

Liquid-phase reactions at high pressures. I. Hydrolysis of esters, and the Knoevenagel reaction. D. M. NEWITT, R. P. LINSTAD, R. H. SAPIRO, and E. J. BOORMAN (J.C.S., 1937, 876—883).—The reaction $\text{AcOH} + \text{EtOH} \rightleftharpoons \text{EtOAc} + \text{H}_2\text{O}$ has the same equilibrium const. at 5000 atm. as at 1 atm., but both the esterification reaction and the hydrolysis by mineral acid are greatly accelerated. The hydrolysis of $\text{Et}_2\text{C}_2\text{O}_4$, $\text{CN}\cdot\text{CH}_2\cdot\text{CO}_2\text{Et}$ (I), $\text{CH}_2\text{Cl}\cdot\text{CO}_2\text{Et}$, $\text{CCl}_3\cdot\text{CO}_2\text{Et}$, Et malonate, and Et dif-
FF* (A., I.)

ethylmalonate by H_2O or HCl at room temp., and the esterification of $\text{CCl}_3\cdot\text{CO}_2\text{H}$ are greatly accelerated by high pressure. Hydrolysis of linseed and soya-bean oils by dil. acid is also accelerated, but tristearin cannot be hydrolysed by H_2O , dil. acid, or dil. alkali at room temp./5000 atm. The reaction of (I) with cyclopentanone in presence of piperidine (II) is accelerated at high pressure, whilst interaction of (I) with cyclohexanone (III) occurs at $60^\circ/5000$ atm. without addition of (II). As (III) does not condense with either Et malonate or EtOAc under these conditions, it is concluded that either (I) or the condensation product, in the imino-phase, catalyses the high-pressure reaction. Some reaction occurs between (I) and Et 2-methylcyclohexanone-2-carboxylate at high pressure (cf. A., 1936, 846), but none with Et 2-methylcyclohexanone-2- β -propanate. (III) and cyclopentanone show self-condensation under high pressure, especially in presence of (II), yielding 2- Δ^1 -cyclohexenylcyclohexanone and 2-cyclopentylidenecyclopentanone, respectively. The results do not accord with the conclusion that liquid-phase reactions which do not proceed at atm. pressure also do not proceed under like conditions at high pressure (A., 1934, 603). J. W. S.

Reactions at high pressure and the apparatus used. B. WAESER (Chem.-Ztg., 1937, 52, 534—535).—The influence of high pressures up to 30,000 atm. on reaction velocity, bacteria and toxins, the phase changes of elements, and electrode phenomena are reviewed. Basset's work on the synthesis of NH_3 (cf. A., 1935, 455, 593; 1936, 1456) is described in greater detail. R. S. B.

Mechanism of dissolution of pure metals and alloys. M. CENTNERSZWER (Trav. Congr. Jubil. Mendeleev, 1937, 2, 217—240).—The diffusion theory of dissolution of metals and alloys in acids or alkalis is of only very limited application; in most cases the velocity of dissolution is determined by other factors, viz., passivation of the metal surface and H overpotential at the various surfaces. The process of dissolution involves diffusion, chemical, and, in the case of impure metals and alloys, electrochemical processes. The velocity of the chemical process is expressed by $dx/dt = K(C - x)^n$, where C is the concn. of reagent at the metal surface, and n is a const., varying from 0.25 to 4. R. T.

Explosion of aluminium powder dust clouds. R. B. MASON and C. S. TAYLOR (Ind. Eng. Chem., 1937, 29, 626—631; cf. A., 1936, 34, 570).—Using two powders with an average particle thickness of 0.28 and 0.14 μ , the lower limit of ignition in dry air was at 40—50 mg. of Al per litre, and of explosion, approx. 110 mg. per litre. Explosion ceased when the O_2 content of the air was reduced below 10 vol.-% with CO_2 ; N_2 was a slightly less efficient inhibitor. Ignition was obtained by blowing an Al fuse in the explosion vessel. Published results are discussed. R. C. M.

Homogeneous catalysis by means of halogens. H. J. SCHUMACHER (Angew. Chem., 1937, 50, 483—488; cf. this vol., 314).—The homogeneous catalytic action of halogen mols. and atoms, mainly in the gas

phase, including halogen-sensitised photochemical reactions, is reviewed. R. S. B.

Retardation of chemical reactions. VII. Reaction between potassium permanganate and hydrogen peroxide in acid solution. K. C. BAILEY and G. T. TAYLOR (*J.C.S.*, 1937, 994—999).—At const. initial $[\text{KMnO}_4]$ and $[\text{H}_2\text{SO}_4]$ the reaction velocity (v) increases with increasing initial $[\text{H}_2\text{O}_2]$ to a max. at $[\text{H}_2\text{O}_2] = 0.005$, falls to a min. at $[\text{H}_2\text{O}_2] = 0.16$, and then rises slowly. At const. $[\text{KMnO}_4]$ and $[\text{H}_2\text{O}_2]$ (<0.001), v increases with increasing $[\text{H}_2\text{SO}_4]$ and tends to become const. at high $[\text{H}_2\text{SO}_4]$. With const. $[\text{KMnO}_4]$ and $[\text{H}_2\text{O}_2]$ (>0.02), v increases with increasing $[\text{H}_2\text{SO}_4]$ to a max., then falls to a min., and finally rises again. Mn^{++} ions catalyse the reaction strongly at $[\text{H}_2\text{O}_2] \gg$ that corresponding with max. v . v increases with increasing $[\text{KMnO}_4]$, but at high $[\text{H}_2\text{O}_2]$ is not proportional to it. Theories of this reaction do not explain the results. It is suggested that the reduction of MnO_4^- to MnO_3^- and reoxidation of the latter by high-energy H_2O_2 mols may be involved. The empirical relation $v = k_1[\text{H}_2\text{O}_2][\text{H}_2\text{SO}_4][\text{KMnO}_4]/(k_2 + k_3)[\text{H}_2\text{O}_2]^2[\text{H}_2\text{SO}_4]^2$ gives fair agreement with experiment. J. W. S.

Organic catalysts. H. WAHL (*Rev. gén. Mat. col.*, 1937, 44, 265—268).—A review.

Hydrolysis rates of some monoacid triglycerides under the influence of pancreas extract. III. Influence of the reaction product and the constitution of the triglyceride on the hydrolysis rate. K. HOLWERDA (*Rec. trav. chim.*, 1937, 56, 714—726).—The experiments previously described (cf. A., 1937, III, 268; A., 1936, 297) have been extended to the triglycerides of the C_8 — C_{13} fatty acids, the hydrolysis rate being measured in solutions of p_{H} 4.0. The reduction in rate due to acid formation and the negligible effect on the rate of the constitutions of the triglycerides are again observed. C. R. H.

Inactivation of iron catalysts for ammonia synthesis by steam.—See B., 1937, 664.

Activation of specific linkings in complex molecules at catalytic surfaces. III. Carbon-hydrogen and carbon-carbon linkings in propane and ethylene. K. MORIKAWA, N. R. TRENNER, and H. S. TAYLOR (*J. Amer. Chem. Soc.*, 1937, 59, 1103—1111; cf. A., 1936, 1213, 1346).—The exchange reaction between C_3H_8 and D_2 at a Ni catalyst occurs in a temp. range $90^\circ <$ that for the hydrogenation decomp. yielding C_2H_6 and CH_4 . The exchange is inhibited by H_2 to the -0.76 power and the decomp. to the -2.6 power of $[\text{H}_2]$. Methods for the prep. of C_3D_8 and deuteropropanes and deuterioethanes of known C-D content are described. The availability of H_2 in a Ni-kieselguhr catalyst for exchange reactions has been studied. Reaction of C_2H_4 with D_2 at a Ni surface at -80° to 65° involves exchange as well as addition; exchange also occurs at a Cu catalyst. C_2H_4 polymerises to C_4^- and higher hydrocarbons at 0° on Ni, but the breaking of the C-C linking is negligible. E. S. H.

Kinetics of the decomposition of carbonyl selenide on an allotropic selenium surface. R. H. PURCELL and F. D. ZAROORBUX (*J.C.S.*, 1937,

1029—1035).—The v.p. of COSe has been redetermined over the temp. range -95° to -23° . The latent heat of evaporation is 49.3 g.-cal. per g. The decomp. of the vapour on a Se surface formed by its own decomp. has been studied at 120° , 130° , and 140° . The results indicate that the form of Se which first deposits (Se I) changes into a more stable form (Se II). At 120° , and at lower COSe pressures at 130° and 140° , this change is more rapid than the decomp. of COSe , so the catalytic surface consists of Se II, whereas at higher pressures at 130° and 140° the decomp. is the more rapid and the surface comprises Se I. The decomp. is unimol. on both allotropes, but Se II has the greater catalytic activity. At intermediate pressures at 130° and 140° both Se I and Se II may be present and the course of the reaction can be interpreted from the proportions of the allotropes present. J. W. S.

Cuprene formation. J. M. CALHOUN (*Canad. J. Res.*, 1937, 15, B, 208—223).—Using a flow method the formation of cuprene (I) by the CuO -catalysed polymerisation of C_2H_2 has been studied from 230° to 330° and the results support the photochemical evidence of a chain mechanism. The reaction shows an induction period which diminishes as the temp. rises, followed by the rapid attainment of a max. rate and a subsequent gradual decrease in rate. At 330° the reaction is explosive. Exit gases contain considerable amounts of C_2H_4 and free H_2 which increase with rise of temp. The H_2 split off does not bear a const. ratio to amount of (I) formed. The yield of (I) based on C_2H_2 reacting is approx. 85%. An exponential expression expressing the rate of absorption of C_2H_2 over 72 hr. at 290° under the conditions of experiment is derived and is integrated to give the amount of (I) formed at any time, thereby making it possible to predict yields. The heat of polymerisation, calc. from the heat of combustion of (I), is 61—70 kg.-cal. per mol. of C_2H_2 polymerised. W. R. A.

Catalytic toxicity and chemical structure. II. Influence of chain length in the alkyl sulphide and thiol series. E. B. MAXTED and H. C. EVANS (*J.C.S.*, 1937, 1004—1008; cf. this vol., 316).—The relative inhibiting powers of both n -alkyl sulphides and n -alkylthiols on the hydrogenation of crotonic acid catalysed by Pt-black increases with increasing length of the C chain. The effects of the sulphides are 2.5—2.6 times as great as those of the corresponding thiols. J. W. S.

Role of copper in methyl alcohol catalysts.—See B., 1937, 646.

Catalytic activity of cobalt sulphide for gas-phase reduction of nitrobenzene to aniline.—See B., 1937, 647.

Catalytic preparation of propyl and isopropyl acetate and butyrate.—See B., 1937, 647.

Attack of nitric esters by diphenylamine in presence of catalysts.—See B., 1937, 732.

Theory of difference effect. M. STRAUMANIS (*Z. Elektrochem.*, 1937, 43, 406—407). W. J. MULLER (*ibid.*, 407). M. STRAUMANIS (*ibid.*, 407).—Polemical (cf. A., 1936, 1474). E. S. H.

Electrolysis of alkali chlorides. Action of magnesium and calcium salts. A. LINARI and G. BONFIGLIO (*Chim. e l'Ind.*, 1937, 19, 252—254).—In the electrolysis of saturated NaCl solutions with a Hg cathode the presence of Mg salts promotes the formation of H_2 at the cathode, but Ca salts have no effect. O. J. W.

Electrochemical behaviour of rhodium. II. Higher oxidation states of rhodium. G. GRUBE and B. GÜ. **III. Potentiometric titration of the higher oxidation states of rhodium in acid solution.** G. GRUBE and K. H. MAYER (*Z. Elektrochem.*, 1937, 43, 397—403, 404—406; cf. A., 1934, 154).—II. The solutions obtained by electrolytic oxidation of $Rh_2(SO_4)_3$ in H_2SO_4 or $Rh(ClO_4)_3$ in $HClO_4$ contain Rh^{IV} and Rh^{VI} , respectively. A dark blue oxide can be pptd. from the Rh^{VI} solutions and redissolved in excess of alkali; from the Rh^{IV} solutions a green oxide is pptd., also sol. in excess of alkali. Rh^{VI} is also formed by oxidation of alkaline solutions of Rh^{III} by Cl_2 or $NaOCl$. The oxidation potential of $Rh^{III} \rightarrow Rh^{IV}$ is +1.40 volts and that of $Rh^{IV} \rightarrow Rh^{VI}$ 1.46 volts. In acid solution Rh^{IV} decomposes in accordance with $3Rh^{IV} \rightleftharpoons 2Rh^{III} + Rh^{VI}$.

III. The above conclusions are confirmed by potentiometric titration of the oxidised solutions with $Fe(NH_4)_2(SO_4)_2$. E. S. H.

Electrolysis of salts of barium and radium in acetone. M. HAÏSSINSKY (*J. Chim. phys.*, 1937, 34, 321—326).—Strongly adhering deposits of Ba compounds are obtained on cathodes of Pt, Au, Ag, Ni, and Cu by electrolysis of small quantities of $BaCl_2$ and $Ba(CNS)_2$ in $COMe_2$ with a Ag anode which combines with anodic oxidation products. Ba and Ra together in solution are deposited simultaneously under these conditions. J. G. A. G.

Electrolytic reduction of ferric sulphate in presence of titanium sulphate. I. G. SCHTSCHERBAKOV and K. J. GRATSCHEV (*J. Appl. Chem. Russ.*, 1937, 10, 607—616).—Practically quant. reduction of Fe^{III} to Fe^{II} in solutions containing $Ti(SO_4)_2$ is achieved by electrolysis (Pb electrodes) at 40—50°, with an asbestos diaphragm. O_2 not containing H_2 is obtained as a by-product, when the c.d. is < 1.25 amp. per sq. dm. R. T.

Influence of superposition of an alternating current on the electro-deposition of zinc and copper. V. I. SKIRSTIMONSKAJA (*J. Appl. Chem. Russ.*, 1937, 10, 617—623).—The yields of Zn or Cu diminish when an a.c. is superposed on a d.c. in the electrolysis of the salts. The nature of the deposits does not vary until the c.d. of the a.c. is 0.7 that of the d.c., above which the Cu deposits become darker in colour, and contain oxides, the Zn deposits become more porous, and the bubbles of H_2 at the cathode become larger. R. T.

Electrochemical oxidation of *n*-butyl alcohol. I. I. RADTSCHENKO (*J. Appl. Chem. Russ.*, 1937, 10, 683—687).— $PrCO_2H$ and $PrCO_2Bu$ are obtained in the anodic oxidation of BuOH in aq. H_2SO_4 . The relative yield of ester falls with increasing duration

of electrolysis, and \propto the ratio of free to dissolved BuOH. R. T.

Electrolysis of phthalic and hemipinic acids.—See A., II, 291.

Electrolysis in the glow discharge. VI. Behaviour of chloric and perchloric acids and their alkali salts. A. KLEMENC and R. EDER (*Z. physikal. Chem.*, 1937, 179, 1—15; cf. A., 1935, 457).—The above in aq. solution are reduced in either the anode or the cathode fall. $HClO_3$ is reduced directly to HCl, apparently by activated H_2O mols. probably produced in the gas phase under the influence of the localised action of the current in the glow: $2HClO_3 + H_2O^* = H_2O + 2HCl + 3O_2$. The amount of $HClO_3$ reduced in the cathode fall is \gg corresponds with Faraday's law. H formed at the poles plays a negligible part in the reductions and polar O is relatively inert. The ratio of the current yield in reduction in the cathode fall to that in reduction in the anode fall is the same for the reduction of $HClO_3$ as for the reduction of H_2SO_4 . The amount of "knallgas" produced is inversely \propto the amount of reaction of the electrolyte. R. C.

Dependence of the rate of photochemical reactions in solution on the concentration of reagents. B. J. SVESCHNIKOV (*Compt. rend. Acad. Sci. U.R.S.S.*, 1937, 15, 177—182).—Theoretical. The rate of irreversible reactions proceeding in presence of a second reagent A (e.g., oxidation or reduction reactions in presence of an acceptor) is discussed. The pseudo-unimol. const. then $\propto [A]$. J. S. A.

Photochemical union of hydrogen and chlorine. M. TAMURA (*Rev. Phys. Chem. Japan*, 1937, 11, 1—15).—By utilising the method of thermal analysis the change in the reaction velocities with time in the union of H_2 and Cl_2 has been studied both before the photostationary state was reached and after the light was shut off. Theoretical explanations are given. The mean life of reaction chains has been calc. The $[Cl]$ has also been calc. Since the velocity of formation of HCl \propto the 0.6 power of the light intensity, chains are terminated principally by self-neutralisation; simple triple collisions of the type $Cl + Cl + M \rightarrow Cl_2 + M$ are, however, not favoured. W. R. A.

Photochemical investigations. IV. Photochemical decomposition of deuteroammonia. E. O. WIG (*J. Amer. Chem. Soc.*, 1937, 59, 955—958; cf. this vol., 370).—The photo-decomp. of NH_3 is about 1.3—1.5 times as rapid as that of ND_3 in the pre-dissociation bands at $\lambda 2100$ Å. The same ratio holds approx. for the rate of decomp. of ND_3 at 2138 Å. in a discrete band to that at 2100 Å. in a diffuse band. The data are discussed. E. S. H.

Photo-decomposition of chlorine dioxide in carbon tetrachloride solution. J. W. T. SPINKS and H. TAUBE (*J. Amer. Chem. Soc.*, 1937, 59, 1155—1156).—Using $\lambda 3650$ Å., the decomp. products contain relatively large amounts of Cl_2O_8 . E. S. H.

Photolysis of azomethane. M. BURTON, T. W. DAVIS, and H. A. TAYLOR (*J. Amer. Chem. Soc.*, 1937, 59, 1038—1045).—The rate of photolysis by $\lambda > 3500$ Å., using a Hg lamp, and the nature of

the products have been determined at different temp. The amount of N_2 produced is generally $>$ that of gaseous hydrocarbon. The amount of higher hydrocarbon (expressed as C_3H_8) increases with degree of decomp. and with lowering of temp.; no H_2 , and only a little unsaturated hydrocarbon, is produced. Preliminary work on decomp. in presence of $MeCHO$ is reported. It appears that decomp. is not by rupture, but by a rearrangement mechanism to form stable mols. The mechanism is discussed; the hypothesis of the formation of an additive compound by reaction with free Me radicals is consistent with the results. E. S. H.

Use of deuterio-compounds as indicators for the presence of free radicals in organic decomposition reactions.—See A., II, 323.

Preparation of alkali deuterides. L. HACKSHILL and A. BOROCOCO (Compt. rend., 1937, 204, 1475—1477).—Alkali deuterides are prepared by synthesis in the same way as hydrides; they have analogous formulæ and appear to be identical in crystal form. W. R. A.

Reactions between potassium chlorate and ammonium salts. HANTKE (Angew. Chem., 1937, 50, 473—476).—Mixtures of $KClO_3$ and NH_4 salts react after many days' storage at room temp., but explosively at higher temp. Analyses of the products are approx. in agreement with $30KClO_3 + 20NH_4X = 20KX + 4KNO_3 + 6KCl + 24HCl + 18O_2 + 6HNO_2 + 2HNO_3 + 4N_2 + 24H_2O$; there may be further complications depending on the particular NH_4 salt used. A. G.

Chelation of diamines with cupric salts. F. W. CHATTAWAY and H. D. K. DREW (J.C.S., 1937, 947—948).—The action of $(CH_2NH_2)_2$ ($= en$) (1.9 g. or 3.8 g.) on aq. $CuCl_2 \cdot 2H_2O$ (5.3 g.) yields *bisethylenediamminocupric cuprichloride* (I) (light greenish-blue needles, m.p. 233°, readily sol. in H_2O , insol. in org. solvents) and $[Cu en_2]Cl_2 \cdot H_2O$ (II) (deep purple needles, m.p. 218°), respectively. The action of aq. K_2PtCl_4 on (I) or (II) yields $[Cu en_2]PtCl_4$ (III) (lilac-pink, sparingly sol. in H_2O). Addition of dil. HCl (2 or 4 equivs.) to (I) or (II) yields $[enH_2]CuCl_4$ (golden-yellow leaflets, m.p. 272°), a reaction reversed by $NaOH$, but no intermediate stage could be isolated. $CuCl_2$ and isobutylenediamine similarly yield *bisobutylenediamminocupric cuprichloride* (IV) [light blue or bluish-green, m.p. 232° (decomp.), sol. in H_2O or hot $EtOH$] and *chloride* (V) (dark purple, very sol. in H_2O , sol. in cold $EtOH$). (V) dried in air contains $0.5H_2O$ and has m.p. 245°; a dihydrate also exists. With K_2PtCl_4 (IV) and (V) yield the platinochloride [lilac, m.p. about 228° (decomp.), insol. in H_2O]. The palladochloride is unstable, decomp. in contact with the reacting solution to give *isobutylenediaminopalladous chloride* (dark yellow). *Bisisobutylenediamminocupric α -bromocamphor- π -sulphonate* (mauve, m.p. 237°) could not be resolved and geometric isomerides of (IV) could not be isolated. $CuSO_4$ and $(CH_2NH_2)_2$ yield *bisethylenediamminocupric cuprisulphate hexahydrate* (light blue), which with K_2PtCl_4 yields (III). J. W. S.

Action of chlorine on certain calcium silicates. P. P. BUDNIKOV and E. I. KRETSCH (Ukrain. Chem. J., 1937, 12, 183—189).—Equal amounts of $CaCl_2$ are produced in a given time by chlorination at 18—750° of $CaO \cdot SiO_2$, $2CaO \cdot SiO_2$ (both prepared from CaO and SiO_2 at 1450°), or CaO , whence it is concluded that CaO is present in the free state in all cases. R. T.

Attack on metals by carbon tetrachloride in presence of water. R. DUBRISAY and G. ARDITTI (Compt. rend., 1937, 204, 1568—1570).—When CCl_4 is introduced into one limb of an inverted V-tube, and H_2O into the other, and, after introduction of a metal, the whole is evacuated and sealed, Zn is attacked when in the CCl_4 , but not when in the H_2O , whilst Cu is attacked only when in the H_2O . It is concluded that the $CuCl_2$ is reduced by at. H formed by the action of Zn on H_2O or dil. HCl . The action on Cu is attributed to reaction between CCl_4 and H_2O giving rise to $COCl_2$ or Cl_2 . This view is confirmed by the fact that the gas evolved is mainly CO. J. W. S.

Constitution of double salts. XX. Diamines with benzidine and tolidine.—See A., II, 335.

Reactions of dihydroxyfluoboric acid. J. W. KROEGER, F. J. SOWA, and J. A. NIEUWLAND (J. Amer. Chem. Soc., 1937, 59, 965—969).— $H_3BO_2F_2$ contains 1 strongly acidic and 2 non-acidic H atoms; it reacts with $NiCO_3$, forming $Ni(H_2BO_2F_2)_2 \cdot 3H_2BO_2F_2$. With dioxan the product is $C_4H_2O_2 \cdot H_2BO_2F_2$, m.p. 139.5—140.5°. The prep. of $(AcOBF)_2$, m.p. 206—207°, is described and its structure discussed.

E. S. H.
New boric acid [hypoboric acid], $H_4B_2O_4$, and its esters. E. WIERG and W. RUSCHMANN (Ber., 1937, 70, [B], 1393—1402).—Esters $BCl(OR)_2$ are readily obtained from BCl_3 (1 mol.) and ROH (2 mols.) at low temp. or by admixture of BCl_3 and $B(OR)_3$. They are readily converted by $Na-Hg$ (prepared in a vac.) in complete absence of moisture into hypoboric esters. *Me hypoborate*, $[B(OMe)_2]_2$, has m.p. —24.9° to —23.7°, b.p. 93°. The corresponding Et_4 ester is not readily volatile at room temp. They are colourless liquids of pleasant odour which at room temp. readily and quantitatively decompose into normal boric esters and B, which is thus readily obtained in a reactive form. When hydrolysed with H_2O they give free *hypoboric acid* as a colourless solid. Its aq. solutions are readily oxidised to H_3BO_3 when exposed to air; they reduce $KMnO_4$ and $AgNO_3$ but not I. Addition of acid increases the stability of the solutions. H. W.

[Thermite type of] combustion reactions. M. TRAUTZ and J. D. HOLTZ (J. pr. Chem., 1937, [ii], 148, 225—265).—The effects of the max. v.p. and temp. attained during this type of reaction and of the two-phase separation occurring are discussed on the assumption that the equilibrium established obeys the Lorenz mass-action law for condensed systems deducible from the thermodynamic potentials. This is confirmed by experimental data for numerous reactions. Tammann's potential series for high temp. is also extended. BeO cannot be reduced to Be by Al . The reaction $3SiO_2 + 4Al \rightarrow 2Al_2O_3 + 3Si$ and

certain reactions in presence of S have been studied in detail. It is probable that equilibrium is nearly attained in these reactions. J. W. S.

Separation of the rare earths. W. FISCHER, W. DIETZ, and O. JUBERMANN (*Naturwiss.*, 1937, 25, 348).—The principle of distribution may be applied to the separation of the rare earths. It is possible to find pairs of liquids between which rare-earth compounds will distribute themselves, and for which the distribution coeff. is sufficiently large to enable a reasonable separation to be made. The rare-earth halides will distribute themselves between H_2O and alcohols, ethers, ketones, etc., the distribution coeffs. being different for the different elements. The distribution equilibrium may be shifted by the addition of various substances to the solvents, and other salts, in addition to the halides, may be used. The difference in distribution coeff. of the salts of two rare-earth elements differing in at. no. by 1 may amount to 50%. Automatic distribution fractionating columns may be used. A. J. M.

Selenides of the rare earths. W. KLEMM and A. KOCZY (*Z. anorg. Chem.*, 1937, 233, 84—96).—Selenides of La, Ce, Pr, Nd, Sm, Dy, Er, Yb, Y, and Sc have been obtained by heating the oxide or chloride in gaseous H_2Se . With La, Ce, and Pr polyselenides (M_2Se_4) are formed; Nd gives an impure polyselenide, whilst others give M_2Se_3 . The polyselenides form M_2Se_3 when heated in vac. *d*, X-ray diagrams, and magnetic data are given, and there is a discussion of poly-compound formation in general among the rare earths. F. J. G.

Purification of europium. H. N. MCCOY [with A. S. KING, L. PAULING, G. P. BAXTER, and F. D. TUENMLER] (*J. Amer. Chem. Soc.*, 1937, 59, 1131—1134).—A cryst. ppt. of pure $EuCl_2 \cdot 2H_2O$ is obtained by reducing with Zn a conc. solution of rare-earth chlorides (containing $\approx 70\%$ of Eu) and treating with conc. HCl. The isomorphism of $EuSO_4$ and $BaSO_4$ has been established by X-ray examination. The at. wt. of Eu has been determined as 151.95. E. S. H.

Nitrogen hexoxide (NO_3). H. J. SCHUMACHER (*Z. anorg. Chem.*, 1937, 233, 47—48).—Attention is directed to the work of Schumacher and Sprenger (*A.*, 1928, 1100; 1929, 515) and Sprenger (*A.*, 1931, 1239). F. J. G.

Solubility of arsenious oxide in aqueous magnesium, calcium, strontium, and barium chlorides and bromides. E. JÓZEFOWICZ (*Rocz. Chem.*, 1937, 17, 169—174).—The solubility at 25° of As_2O_3 in aq. Mg, Ca, Sr, and Ba chlorides and bromides, over a range of concns. from 0 to 7*N* for Ca and Mg, and up to saturation for Sr and Ba salts, has been determined. The compounds $3As_2O_3 \cdot SrBr_2 \cdot 6H_2O$ and $3As_2O_3 \cdot CaBr_2 \cdot 6H_2O$ are described, and the existence of $2As_2O_3 \cdot BaCl_2$ and $2As_2O_3 \cdot BaBr_2$ is confirmed. R. T.

New oxide of bromine, BrO_3 . I. R. SCHWARZ and M. SCHMEISSER (*Ber.*, 1937, 70, [B], 1163—1166).—A mixture of Br and O_2 (1 : 5) is subjected to the silent electric discharge between Al electrodes, the mixture being cooled in the tube itself. After removal of O_3 , the excess of Br is distilled at -30° , when BrO_2 , decomp. about 0° , remains as an egg-yellow

solid. In a high vac. at 0° BrO_2 appears to undergo disproportionation. H. W.

Recovery of iodine from waste iodide solutions. C. C. DE WITT (*J. Chem. Educ.*, 1937, 14, 215—217).—Details for the recovery and purification of the I, and its conversion into KI or NaI, are given. L. S. T.

Chemistry of rhenium. G. E. F. LUNDELL and H. B. KNOWLES (*J. Res. Nat. Bur. Stand.*, 1937, 18, 629—637).—A dil. $KReO_4$ solution when acidified with H_2SO_4 and passed through a Jones reductor at approx. 5° yields a strongly reducing solution, which deposits Cu or Ag from aq. solutions of their salts. Oxidation to Re^{VII} by $KMnO_4$ shows the Re in this solution to have a valency of -1 , and thus to resemble the halogens in their hydrides. The Re is oxidised to a valency of $+1$ if the solution is heated to 50° in absence of O_2 . Re may be electrodeposited from solutions containing 5% of H_2SO_4 at a c.d. of 0.25 amp. per sq. dm. The deposits are slightly contaminated. The deposited Re can be oxidised directly to $HReO_4$ by exposure to moist air or O_2 , or by anodic oxidation. The deposits are stable when dry. H. J. E.

Isomerism and allotropy of oxides of iron. Ferromagnetic basic iron chlorides. R. S. HILPERT and R. SCHACHT [with A. HOFFMANN] (*Ber.*, 1937, 70, [B], 1437—1446).—Reduction of Fe_2O_3 by H_2 -steam at 400° leads exactly to $FeO \cdot Fe_2O_3$. This can also be effected by dry NH_3 at 300° provided the Fe_2O_3 has been heated previously at $>600^\circ$. Pptn. of an equimol. mixture of Fe^{II} and Fe^{III} salts by alkali gives a product about $FeO \cdot 2Fe_2O_3$ reduced by H_2 -steam or dry NH_3 to $FeO \cdot Fe_2O_3$. The material obtained by pptg. Fe^{II} by aq. NH_3 in presence of KNO_3 and air has not exactly the composition Fe_3O_4 , which it acquires when heated in H_2 -steam or NH_3 . The ultimate production of Fe_3O_4 under so varied conditions establishes its chemical individuality. Whether compounds with other mol. ratio exist cannot be established, since to the limit $FeO \cdot Fe_2O_3$ solid solutions are formed which give identical X-ray diagrams. This is unaffected when the materials are heated at 1000° under CO_2 , although a deep-seated chemical change is caused thereby. This similarity of cryst. structure has caused the differences in chemical behaviour to be overlooked. It is particularly shown in the behaviour of magnetites towards Cl_2 and O_2 . If the Fe_2O_3 used has not been heated above 500° the $FeO \cdot Fe_2O_3$ obtained therefrom adds Cl at $>200^\circ$ giving a basic chloride, $FeOCl \cdot Fe_2O_3$. If it has been heated at 600 — 900° reaction occurs at 270 — 320° with formation of $FeCl_3$ and Fe_2O_3 . Further complications arise from the dependence of the properties of Fe_3O_4 on the reducing agent applied to Fe_2O_3 . That obtained with H_2 -steam shows the lines of Fe_2O_3 and others which cannot be attributed to α - Fe_2O_3 . Use of NH_3 leads to a product which is slightly ferromagnetic and has only the α - Fe_2O_3 lines. Oxidation of Fe by CO_2 or steam occurs so slowly that a high temp. is requisite. Ferrum reductum in CO_2 -steam at 850° gives a product containing Fe and FeO much in excess of that required by Fe_3O_4 . This and Fe_3O_4 from technical sources

gave $\alpha\text{-Fe}_2\text{O}_3$ when heated with Cl_2 . Ferroferrites of the second and third group which have been heated at about 300° add Cl in amount corresponding with $[\text{FeO}]$, the pptd. product and metaferrite thus giving compounds $\text{FeOCl}_2\text{Fe}_2\text{O}_3$ and $\text{FeOClFe}_2\text{O}_3$, respectively. The property of adding Cl disappears when the ferroferrites are heated at $600\text{--}1000^\circ$ whereby they are converted into the variety which is essentially oxidised and simultaneously decomposed with production of FeCl_3 . If the ferroferrite has been heated only at 600° the product is $\gamma\text{-Fe}_2\text{O}_3$, whereas $\alpha\text{-Fe}_2\text{O}_3$ results if the product has been heated at 900° . Treatment with Cl_2 is therefore valuable in investigating the previous history of a magnetite. Ferroferrites which add Cl are transformed by gaseous O_2 at $100\text{--}120^\circ$ into $\gamma\text{-Fe}_2\text{O}_3$. $[(\text{NH}_4)_2\text{S}_2\text{O}_8]$ can replace O_2 . Ferroferrites which do not add Cl are slowly oxidised by O_2 at $300\text{--}400^\circ$ to non-magnetic $\alpha\text{-Fe}_2\text{O}_3$. Ferromagnetism disappears entirely when Fe^{II} is completely oxidised. The chemical formulation of the ferroferrites is discussed. The basic chloride $\text{FeOClFe}_2\text{O}_3$ is the first known ferromagnetic salt. Its Röntgen diagram is similar to that of magnetite. Cl is replaced by O at 240° with production of a ferromagnetic oxide giving the lines of spinel and $\alpha\text{-Fe}_2\text{O}_3$, whereas at 400° it gives a rhombohedral Fe_2O_3 which is completely non-magnetic. Warming with dil. Na_2CO_3 or NaOH replaces Cl by OH giving a strongly ferromagnetic hydroxide, which loses H_2O at $300^\circ/\text{vac.}$ giving a strongly ferromagnetic Fe_2O_3 . Ferromagnetism can therefore occur with rhombohedral and cubic Fe_2O_3 , but it does not appear possible to obtain a cubic Fe_2O_3 without ferromagnetic properties. H. W.

Preparation of iron oxide as a source of high-purity iron. H. E. CLEAVES and J. G. THOMPSON (J. Res. Nat. Bur. Stand., 1937, 18, 595—607).—Various methods of purifying Fe salts are reviewed. The prep. of pure Fe_2O_3 from electrolytic Fe by conversion into $\text{Fe}(\text{NO}_3)_3$, recrystallisation, and pptn. with aq. NH_3 is described. Si (0.005—0.006%) was the chief impurity in the product; Al, Ca, Mg, and Cu together were $<0.001\%$. H. J. E.

Investigation of mode of formation and structure of active α -ferric and beryllium oxides with Hahn's emanation method and X-rays. R. MUMBRAUER and R. FRICKE (Z. physikal. Chem., 1937, B, 36, 1—19; cf. this vol., 171).—During dehydration of $\alpha\text{-Be}(\text{OH})_2$ and $\alpha\text{-Fe}_2\text{O}_3\text{H}$ with admixed radio-Th the rate, E , at which emanation is given off increases. Tempering the active oxides obtained by dehydration of the hydroxides reduces E , due to decrease in the internal surface as a result of increase in the orderliness of the lattice. The total surface area calc. from the primary particle size determined by X-ray investigation is the val. calc. from E , and the discrepancy increases with rise in the temp. of prep. of the oxides. It is inferred that E is determined by the secondary structure and that the emanation method is suitable for determining the internal surface area reached comparatively rapidly by a gas. Above a temp. equal to approx. half the abs. m.p. E for strongly ignited inactive $\alpha\text{-Fe}_2\text{O}_3$ begins to rise with the temp., which is

apparently due to a temp.-loosening of the lattice, possibly place-changing. The corresponding temp. for BeO is considerably lower, the determining factor being here, perhaps, loosening of the secondary structure or adsorbing layers. R. C.

Hahn's emanation method and density of packing. R. FRICKE and O. GLEMSER (Z. physikal. Chem., 1937, B, 36, 27—29).—The emanating power of Fe^{III} oxide preps. with admixed radio-Th is reduced by compression. R. C.

Potassium ferrites. S. KRZYŻANSKI (Rocz. Chem., 1937, 17, 146—153).—Ortho- $\text{Fe}(\text{OH})_3$ and conc. aq. KOH at 160° yield hexagonal crystals of $\text{K}_2\text{O}\cdot 2\text{Fe}_2\text{O}_3$ (I), difficultly hydrolysed by H_2O . At 200° (I) is converted by KOH into square plates of $\text{K}_2\text{O}\cdot \text{Fe}_2\text{O}_3$, and at $>200^\circ$ into octahedral crystals of the same composition, both readily hydrolysed by H_2O . Crystallographic data for the salts are recorded. R. T.

Prussian-blue paradox. D. DAVIDSON (J. Chem. Educ., 1937, 14, 238—241).—The reactions between Fe^{III} and $\text{Fe}(\text{CN})_6^{4-}$ and Fe^{II} and $\text{Fe}(\text{CN})_6^{3-}$ to form Prussian-blue (I) and Turnbull's blue, respectively, are markedly influenced by the redox equilibrium $\text{Fe}^{III} + \text{Fe}(\text{CN})_6^{4-} \rightleftharpoons \text{Fe}^{II} + \text{Fe}(\text{CN})_6^{3-}$, which is displaced largely to the right. Excess of Fe^{III} hinders instead of accelerates the formation of (I), but excess of Fe^{II} favours the formation of a blue product from $\text{Fe}(\text{CN})_6^{3-}$. The slowness of the formation of (I) is due to the almost complete disappearance of the ions required for its formation, as a result of the immediate establishment of the above equilibrium. In testing for org. N, the common practice of adding FeCl_3 is unnecessary and undesirable. L. S. T.

Formulation of Prussian-blue. D. DAVIDSON (J. Chem. Educ., 1937, 14, 277—281; cf. preceding abstract).—A discussion. Sol. Prussian-blue may be regarded as the K salt of ferri-ferrocyanic acid, $\text{H}^+[\text{Fe}(\text{CN})_6]^{3-}\text{Fe}^{II}$, named "berlinic acid." Its colour and composition are accounted for by assuming polynuclear complex formation between Fe^{III} and the N end of the (CN) groups present in $\text{Fe}(\text{CN})_6^{3-}$. This supercomplex is highly polymerised owing to stereochemical restrictions. Insol. Prussian-blue is Fe^{III} berminate, $\text{Fe}^{III}[\text{Fe}(\text{CN})_6]^{3-}\text{Fe}^{II}_3$, and Turnbull's blue is ferrous berminate, $\text{Fe}^{II}[\text{Fe}(\text{CN})_6]^{3-}\text{Fe}^{II}_2$, or, as ordinarily pptd., a double K Fe^{II} berminate. The colour and composition of the complex ferrocyanides of Zn, Cu, or Ag with K can be explained in a similar manner by assuming polynuclear complexes based on structural units derived from a consideration of the co-ordination numbers of the metals concerned. L. S. T.

Metal carbonyls. W. HIEBER (Z. Elektrochem., 1937, 43, 390—397).—A review of published work. E. S. H.

Action of primary aromatic amines on 1 : 6-dichlorodiethylenediamminocobaltic chloride.—See A., II, 286.

Surface reactions, and some reactions in organic solvents. B. STEIGER (Mikrochem., 1937, 22, 216—227).—The occurrence of reaction between solid components when warmed together [e.g., $\text{Ni}(\text{OH})_2$

with dimethylglyoxime (I) or rubeanic acid] or when rubbed together in the absence of solvent [*e.g.*, PbPh₄ and dithizone (II)] is discussed. Reaction may be facilitated by the presence of a solvent for one of the substances only, *e.g.*, between Cu₂C₂ and (II) in presence of CHCl₃. Ni(CO)₄ reacts directly with (I) and (II), and traces of Ni(CO)₄ in oils etc. may be so detected. This and other drop reactions in non-aq. media may be carried out on a liquid (H₂O) surface to enhance the sensitivity.

J. S. A.

Constitution, optical activity, and photochemical behaviour of platinumous complexes. III. I. LIFSCHITZ and W. FROENTJES (Z. anorg. Chem., 1937, 233, 1—34; cf. A., 1935, 1335).—With a view of elucidating their structure complex platinumous derivatives of SET·CHMe·CO₂H (AH) have been studied chemically, polarimetrically, and spectroscopically, and compared with other platinumous complexes. α- and β-PtA₂ are *cis*- and *trans*-isomerides of Pt($\begin{smallmatrix} \text{SEt} \\ \diagup \quad \diagdown \\ \text{CO} \end{smallmatrix}$)CHMe)₂, the *cis* compound being the more stable. Complexes X₂Pt(AH)₂ may be of two types which differ widely in reactivity etc., viz., (I) *cis*- or *trans*-(HX...)₂Pt($\begin{smallmatrix} \text{SEt} \\ \diagup \quad \diagdown \\ \text{CO} \end{smallmatrix}$)CHMe)₂ (a loose additive compound with 6-covalent Pt) and (II) *cis*- or *trans*-X₂Pt(...AH)₂.

In solution there is equilibrium PtA₂ + 2HX \rightleftharpoons (I) \rightleftharpoons (II). *trans*-Halides are of type (II); *cis*-halides and *trans*-(ClO₄)₂Pt(AH)₂ are of type (I). From *d*- or *l*-AH the following compounds are obtained: *cis*-Br₂Pt(AH)₂ (in solution only), [α]_D¹⁸ +14° in CHCl₃; *trans*-Br₂Pt(AH)₂ (III), m.p. 221—222°, [α]_D¹⁸ +9° in EtOH, mutarotation occurs in MeCN, [α]_D¹⁸ max. +34°; *trans*-I₂Pt(AH)₂ (IV), decomp. 230°, [α]_D¹⁸ ±13° in EtOH, ±13° in MeCN + 10% EtOH; *trans*-I₂Pt(ANa)₂; *cis*-ClO₄PtA(AH), m.p. 195—197° with decomp., [α]_D¹⁸ ±41° in EtOH; *trans*-(ClO₄)₂Pt(AH)₂·2H₂O, m.p. 118°, [α]_D¹⁸ ±37° in EtOH; *cis*-Cl₂Pt(Ame)₂, [α]_D¹⁸ 7.5° in Et₂O; *trans*-Br₂Pt(Ame)₂, [α]_D¹⁸ ±14° in MeOH; *trans*-I₂Pt(Ame)₂, [α]_D¹⁸ ±6.1° in MeOH, ±7° in MeCN. (III) and (IV) have the opposite rotation to the parent acid in EtOH, but the same in MeCN. Other compounds: *d*-alanine complexes: Pt(C₃H₇O₂N)₂ decomp. 250°, [α]_D¹⁸ -14° in H₂O; Cl₂Pt(C₃H₇O₂N)₂ [two isomerides, (i) m.p. 185—186° with decomp., [α]_D¹⁸ +54° in EtOH; (ii) decomp. 203°, [α]_D¹⁸ +15° in EtOH, probably respectively *trans*- and *cis*-; also dihydrate of the former, decomp. 152°]; *l*-menthylamine complexes: Cl₂Pt(C₁₀H₂₁N)₂ [two isomerides, (i) m.p. 246°, [α]_D¹⁸ -97° in EtOH, -94° in CCl₄, probably *trans*-, (ii) (impure), m.p. 160—163°, [α]_D¹⁸ -53° in EtOH, probably *cis*-]; [ClPt(C₁₀H₂₁N)₃]Cl, m.p. 120—121°, [α]_D¹⁸ -93° in CCl₄. Absorption spectra in the ultra-violet of PtA₂, X₂Pt(AH)₂ (X = Cl, Br, I), I₂Pt(ANa)₂, and Cl₂Pt(Y)₂ (Y = AsEt₃, PEt₃, SET₂, and C₆H₅N) are recorded and compared.

F. J. G.

Pterotactic derivatives of bivalent platinum with optically active, cyclic *trans*-1 : 2-diamines. F. M. JAEGER and J. TER BERG (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 490—498).—Compounds of the type [Pt(base)₂]Cl₂ have been prepared by reaction between K₂PtCl₄ and cyclopentanediamine (Cptn) and cyclohexanediamine (Chxn).

d-[Pt(1-Cptn)₂]Cl₂ and *d*-[Pt(1-Chxn)₂]Cl₂ were obtained as the only products of reaction with the *l*-bases, and are isomorphous. The two compounds are strongly dextrorotatory between 4200 and 7000 Å., the rotation being > that of the free bases. Their configuration is discussed and it is suggested that the two mols. of cyclic base are inserted into the complex ion in an oblique position, twisted with respect to each other like the wings of a propeller, giving a "ptero-tactic" structure with only axial symmetry. By mixing the *l*- and *d*-forms in equal quantities racemates identical with those formed by reaction with racemic bases were obtained. [Pt(r-Chxn)₂]d-C₃H₄O₆·12H₂O was prepared but could not be separated. Attempts to prepare the inactive [Pt(*d*-Chxn, *l*-Chxn)]Cl₂ led to the formation of the racemic compound [Pt(Chxn)₂]Cl₂·6H₂O. Crystal structures of all compounds are detailed.

O. D. S.

Elements beyond uranium and their chemical behaviour. O. HAHN, L. METTNER, and F. STRASSMANN (Ber., 1937, 70, [B], 1374—1392).—The most important property of the elements beyond U is their precipitability by H₂S from solutions containing much HCl. For more rapid work treatment with Et₂O-H₂O brings them into the aq. layer, whereas the bulk of the U remains in the Et₂O. A further separation is based on their volatility. Similarities between Rh and eka-Rh are found in the absence of electrochemical separation on noble metals from acid solution, of separation with metallic Bi undergoing deposition from alkaline solution, in the quant. precipitability with H₂S from HCl of medium concn. and slight precipitability from very conc. acid, and in the volatility as chloride or oxide at higher temp., whilst differences exist, since eka-Rh is not volatile from H₂SO₄ in a stream of HCl. eka-Os resembles Os in co-separation with metallic Bi, quant. precipitability by H₂S even from highly conc. HCl, quant. precipitability with NaOH in presence of uranyl salts, and volatility as oxide at high temp., and differs from Os in that it is not volatile when distilled with HNO₃ and is electrochemically deposited on Pt in acid solution. eka-Ir and Ir are alike in their co-separation with metallic Bi and almost complete precipitability with H₂S from not too conc. HCl, whereas they differ since eka-Ir has considerable volatility when ignited, is electrochemically deposited from acid solution on Pt, does not form mixed crystals appreciably with (NH₄)₂PtCl₆, and is partly sol. in the pptn. with NaOH. Similarities between Pt and eka-Pt are found in the distinct solubility during pptn. with NaOH, in the formation of mixed crystals during the pptn. of Pt as (NH₄)₂PtCl₆, and in the good precipitability by H₂S from not too conc. HCl; the differences depend on the considerable volatility of eka-Pt when gently ignited and the electrochemical deposition of it on Pt in acid solution.

H. W.

Spectroscopic analysis. N. S. BAYLISS (Soc. Chem. Ind. Victoria, 1936, 36, 1182—1194).—A review.

J. S. A.

Chromatographic analysis. E. COFFARI (Chim. e l'Ind., 1937, 19, 255—256).—A summary of the method and of its applications.

O. J. W.

Principle of the process of qualitative analysis. A. SCHLEICHER (Z. anal. Chem., 1937, 109, 161—166).—Parallels are discussed between the pptn. of metals in the order of increasing solubility products of their sulphides and hydroxides, and their successive electrolytic deposition and spectrographic detection according to the order of their deposition potentials. J. S. A.

Significance of p_H in qualitative analysis. N. A. TANANAEV and S. J. SCHNAIDERMAN (J. Appl. Chem. Russ., 1937, 10, 924—931).—The p_H of N and $0.1N$ solutions of salts afford information as to their identity. The routine determination of p_H is recommended, and its val. in qual. analysis is illustrated.

R. T.

Determination of p_H by means of the glass electrode. M. J. DALLEMAGNE (Biochem. Z., 1937, 291, 159—173).—For accurate determinations the three characteristics (a) asymmetry potential, (b) calibration curve mV/p_H , and (c) calibration curve mV/T° must be known for each glass membrane; these vary with time, especially during the first 15 days of working. The characteristics fulfil the theoretical requirements the more closely the lower is the resistance of the membrane. The val. of the membrane depends on the composition of the glass, its thickness, regularity, and superficial area. The lowering of resistance with rising temp. favours measurements at 37° for certain biological purposes. Irregularities in published results are ascribed to the deviation from the theoretical val. of the potential change with temp.

E. S. H.

Conductometric determination of traces of water in liquid sulphur dioxide.—See B., 1937, 665.

Polarimetric determination of water in acetic acid.—See B., 1937, 647.

Determination of the D_2O content of small quantities of water. H. FROMHERZ, R. SONDERHUFF, and H. THOMAS (Ber., 1937, 70, [B], 1219—1223).—The method involves the adjustment of the d of the sample until a SiO_2 float neither rises nor sinks. Coarse adjustment is effected by alteration in temp. and fine adjustment is regulated by change in pressure. The apparatus is figured. The method is suited to the examination of the aq. product obtained by combustion of org. substances containing D.

H. W.

Iodometric determination of perchlorates, and comparison of methods for their determination. V. BIBER and F. BARSKAJA (J. Appl. Chem. Russ., 1937, 10, 740—750).—0.15—0.25 g. of perchlorate, 0.6 g. of Cr_2O_3 , and 1 g. of Na_2CO_3 are ignited in a CO_2 atm. for 20 min., cooled in CO_2 , the melt is extracted, and the extract is diluted to 100 ml. 12 ml. of 5% HCl and 2 g. of KI are added to 25 ml. of filtrate, followed by 400 ml. of H_2O , and the solution is titrated with $0.1N-Na_2S_2O_3$ (1 ml. = 0.4432 mg. Cl). Trustworthy results are obtained using Rothmund's (A., 1909, ii, 434), Tschernobaev's (A., 1905, ii, 416), or the above methods, but not Blangey's method.

R. T.

Determination of perchlorates.—See A., III, 334.

Standard mixed chloride samples. Effect of ball-mill grinding and mixing on the actual analyses as compared with calculated values. G. F. SMITH (J. Chem. Educ., 1937, 14, 241—242).—Samples of KCl and $NaCl$ ground and mixed by the procedures outlined are satisfactory. L. S. T.

Qualitative tests for acids in presence of thio-sulphates. A. FOSCHINI (Z. anal. Chem., 1937, 109, 246—251).— $S_2O_3^{2-}$ is destroyed by successive additions of H_2O_2 and HNO_3 or HCl . I^- and Br^- are thereby liberated from I^- and Br^- . Cl^- , CrO_4^{2-} , AsO_4^{3-} , PO_4^{3-} , and $Fe(CN)_6^{4-}$ may then be detected as usual. AsO_3^{3-} is detected by addition of $CuSO_4$ to the original alkaline solution; NO_2^- and NO_3^- by reduction to NH_3 .

J. S. A.

Determination of iodine in iodides. R. L. RAIGORODSKA and E. S. BINOVA (Farm. Shur., 1935, No. 1, 23—25).—Free I^- is titrated with $Na_2S_2O_3$ and total I^- with $AgNO_3$. CH. ABS. (e)

Fluorine distillation. D. DAHLE and H. J. WICHMANN (J. Assoc. Off. Agric. Chem., 1937, 20, 297—303; cf. A., 1936, 950).—The rate of distillation of F_2 and its recovery using $HClO_4$ and H_3PO_4 in place of H_2SO_4 were investigated in detail. The recovery \propto the vol. of distillate according to the same logarithmic relation as was previously established, but with $HClO_4$ and H_3PO_4 variations in recovery rate are $>$ with H_2SO_4 .

E. C. S.

Liquid nitrogen in magnetic experiments. P. KAPITZA and C. J. MILNER (J. Sci. Instr., 1937, 14, 201—203).—The dependence on degree of purity of liquid N_2 and magnetic field strength of temp. rises due to the paramagnetism of O_2 present as an impurity is considered. A simple and sensitive method of measuring the O_2 content of liquid N_2 is described.

N. M. B.

Rapid detection of ozone. M. SCHLESINGER-KONSTANTINOVA (Sotz. Rekonstr. i Nauk., 1935, No. 6, 167).—The O_3 produces a fluorescent substance by interaction with a dissolved substance, the amount of O_3 being deduced from the intensity of fluorescence.

CH. ABS. (e)

Determination of traces of hydrogen sulphide in the air. E. QUITMANN (Z. anal. Chem., 1937, 109, 241—246).— H_2S is absorbed by bubbling through 2% aq. $Cd(OAc)_2$ containing $AcOH$. The CdS suspension produced is treated with $0.1N-I^-$, the excess of which is then titrated back.

J. S. A.

Volumetric determination of sulphate with sodium rhodizonate. L. VON ZOMBORY (Magyar chem. Fol., 1935, 41, 189—192; Chem. Zentr., 1936, i, 3369).—The applicability of the method is confirmed.

J. S. A.

Determination of sulphur in coal.—See B., 1937, 637.

Aluminothermic determination of sulphur in iron ores.—See B., 1937, 678.

[Determination of] selenium. J. A. MATHEWS, A. C. CURL, and R. A. OSBORN (J. Assoc. Off. Agric. Chem., 1937, 20, 194—202).—Alkaline ashing may result in the loss of 40% of Se . Wet combustion is preferable. A modification of the Williams and

Lakin method is suggested. By the turbidimetric method of determination $4-20 \times 10^{-7}$ g. of Se can be determined to within 2×10^{-7} g., smaller vols. of reagent being used than prescribed in the standard procedure. Apparatus and a procedure are described for the electrometric titration of $1-2000 \times 10^{-6}$ g. of Se. The colorimetric and gravimetric methods are also discussed.

E. C. S.

Determination of selenium and tellurium in sulphide ores.—See B., 1937, 665, 666.

Titration of nitric acid and its esters in concentrated sulphuric acid. W. D. TREADWELL and H. VONTOBEL (Helv. Chim. Acta, 1937, 20, 573—589).—Titrations have been carried out electrometrically with FeSO_4 dissolved in 30% H_2SO_4 , using a Pt cathode and an anode consisting of a tube in the bottom of which is inserted a plug of gelatinous H_2SiO_3 , the tube being filled with 96% H_2SO_4 , and connexion being made at the top of the tube by means of a Pt spiral coated with PbO_2 . The nitrate is dissolved in conc. H_2SO_4 and N_2 or CO_2 is bubbled through the liquid during titration. The method is applicable at $[\text{HNO}_3] < 6 \times 10^{-6}$ mol. per litre. The accuracy is diminished on reducing the $[\text{H}_2\text{SO}_4]$ on account of the increased volatility of HNO_3 in such solutions. Applications of the method to the determination of nitrate in nitrite and in pptd. BaSO_4 and to the determination of glyceryl and cellulose nitrates are described. Comparison is made with colorimetric determinations.

C. R. H.

Iodometric determination of potassium nitrate. A. S. VETROV (J. Appl. Chem. Russ., 1937, 10, 751—754).—0.2 g. of KNO_3 , 1.5 g. of Cr_2O_3 , and 1 g. of Na_2CO_3 are heated at $800-900^\circ$ for 5 min., in a CO_2 atm., and the Na_2CrO_4 formed is determined iodometrically.

R. T.

Determination of nitric oxide in [coal] gas.—See B., 1937, 639.

Use of the photo-electric comparator in the determination of small quantities of arsenic by the Bougault method. THURET (J. Pharm. Chim., 1937, [viii], 25, 18—23).—Successful use of the photo-electric cell to compare the cloudiness produced in the Bougault method by a minute quantity of As, against that from a standard, depends on stabilising the system against flocculation; this can be done by adding gum arabic, when As at a concn. of 10^{-4} mg. per c.c. can be determined to $\pm 2\%$.

E. W. W.

Determination of small amounts of arsenic in tin. B. TOUGARINOFF (Bull. Soc. chim. Belg., 1937, 46, 142—170).—Sn, containing $< 0.005\%$ of As and $> 0.5\%$ of Sb, is dissolved in 80% aq. $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$, or in H_2SO_4 with subsequent addition of $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{SO}_4$ or $\text{NH}_2\text{OH} \cdot \text{HCl}$, and HCl . As is then distilled off as AsCl_3 , and is determined in the distillate. Following dissolution in FeCl_3 , the distillate is neutralised with NaOH , and As is titrated directly with $0.05N\text{-KBrO}_3$ or with $0.02N\text{-I}$. After dissolution in H_2SO_4 , As is pptd. from the distillate by H_2S , and the ppt. is dissolved in NaOH . The solution is evaporated with HNO_3 , and As is pptd. as Ag_3AsO_4 , which is subsequently dissolved in HNO_3 and titrated with NH_4CNS . Alternatively, the Sn is dissolved in HCl .

As is thereby liberated as AsH_3 , which is absorbed in $0.1N\text{-I}$. The excess of I is then titrated back.

J. S. A.

Determination of the anions of the arsenic and selenium acids in presence of one another. J. MILBAUER (Z. anal. Chem., 1937, 109, 171—177).— AsO_4''' is pptd. as $\text{MgNH}_4\text{AsO}_4$ without interference. AsO_3''' is oxidised with $\text{H}_2\text{O}_2 + \text{NH}_3$ to AsO_4''' , and determined indirectly from the total AsO_4''' . Cl' interferes with the pptn. of SeO_4'' as BaSeO_4 , but pptn. with $\text{Ba}(\text{ClO}_4)_2$ in presence of HClO_4 is quant.; the BaSeO_4 is dried at 105° . SeO_4'' may also be pptd. with benzidine. SeO_3'' is finally found indirectly by determination of the total Se by reduction with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{SO}_4$.

J. S. A.

Determination of arsenic and sulphur in neosalvarsan etc.—See B., 1937, 729.

Optical spectroscopic determination of boron. Polarising attachments. R. K. CALFEE and J. S. McHARGUE (Ind. Eng. Chem. [Anal.], 1937, 9, 288—290).—Natural gas saturated with Me borate in MeOH is ignited in an O_2 blast to excite the spectrum. A standard solution on ignition and polarisation produces a reference spectrum in juxtaposition to the spectrum of the sample. Results for the B content of plant materials are reported.

E. S. H.

Analysis of felspar. Determination of ferric oxide. I. Decomposition of sample. II. Application of titanometry. E. W. KOENIG (J. Amer. Ceram. Soc., 1937, 20, 230—233, 233—235).—I. A 3 g. of sample (200-mesh) is moistened with H_2O or EtOH in Pt dish, heated with 20 c.c. of HF solution, transferred to a flask containing 10 g. of H_3BO_3 , 50 c.c. of 50% H_2SO_4 , and 100 c.c. of H_2O ; the Fe^{III} is then reduced with SnCl_2 and electrometrically titrated (hot) with $0.005N\text{-K}_2\text{Cr}_2\text{O}_7$. Interference due to Pt from the $\text{Na}_2\text{S}_2\text{O}_7$ is avoided.

II. A sample dissolved by the above method is oxidised with KMnO_4 (excess removed by boiling), cooled to 26° , treated with 5 c.c. of 25% NH_4CNS solution, and titrated with TiCl_3 in an atm. of CO_2 .

J. A. S.

Determination of silicon in aluminium and aluminium alloys.—See B., 1937, 687.

Determination of silica in clays.—See B., 1937, 671.

Rapid determination of carbon in fuels.—See B., 1937, 637.

Determination of carbon monoxide in air.—See B., 1937, 733.

Determination of potassium as potassium silver cobaltinitrite. A. M. ISMAIL and H. F. HARWOOD (Analyst, 1937, 62, 443—452).—The complex salt is pptd. in 20% aq. COME_2 , washed once with 50% aq. COME_2 , and subsequently with 80% aq. COME_2 and titrated with $\text{Ce}(\text{SO}_4)_2$. With the procedure outlined the ppt. is of const. composition. 1 ml. of $0.02N\text{-Ce}(\text{SO}_4)_2 = 0.1087$ mg. K. Adaptation of the method to the determination of K in soils is described.

E. C. S.

[Conductometric titration of sodium fluoride.]—See B., 1937, 709.

Development of electro-drop analysis. II. H. FRITZ (Mikrochem., 1937, 22, 168—181).—The detection of NH_4 and Hg by drop tests on a polished Cu sheet is discussed. $\text{Hg}(\text{CN})_2$ reacts in presence of NH_3 . J. S. A.

Colorimetric determination of silver in minerals.—See B., 1937, 686.

Spectrographic determination of magnesium in aluminium alloys.—See B., 1937, 686.

Separation of zinc from cobalt, nickel, and manganese by means of hydrogen sulphide, and subsequent precipitation of zinc with anthranilic acid. E. A. OSTROUMOV (Ann. Chim. Analyt., 1937, [iii], 19, 145—152).—Zn alone is pptd. by the slow passage of H_2S from a $\text{CH}_3\text{Cl}\cdot\text{CO}_2\text{H} + \text{NaOAc}$ buffer solution at p_{H} 2.6, 5 c.c. of 4% aq. acetaldehyde (for 0.05 g. of ZnO) being added during pptn. Filtration of the ppt. is assisted by the addition of cellulose. The ppt. is ignited to ZnO , which is dissolved in HCl and pptd. with anthranilic acid. Zn is finally weighed as Zn anthranilate. J. S. A.

Quantitative electrodeposition of zinc from acid citrate solutions. R. WINCHESTER and L. F. YNTEMA (Ind. Eng. Chem. [Anal.], 1937, 9, 254—256).—Zn is determined by electrodeposition from aq. ZnSO_4 containing 0.0375*M*-citric acid at p_{H} 4—5. Interference is caused by NO_3^- , dimethylglyoxime, $\text{CO}(\text{NH}_2)_2$, Sb, As, Bi, Cd, Co, Cu, Fe, Pb, Mn, Hg, Ni, and Ag, but not by NH_4^+ , Al, Cr, or Sn. The error is about 0.1%. E. S. H.

Determination of cadmium in zinc concentrates and in metallic zinc.—See B., 1937, 684.

[Determination of] lead. P. A. CLIFFORD (J. Assoc. Off. Agric. Chem., 1937, 20, 191—194; cf. A., 1936, 443).— PO_4^{3-} present as impurity in the KCN or NaCN used in the dithizone method interferes by causing slow pptn. of Pb. E. C. S.

Determination of lead by means of 8-hydroxyquinoline. V. HOVORKA (Coll. Czech. Chem. Comm., 1937, 9, 191—206).—The wt. of ppt. obtained using a wide range of concn. of reactants was generally <99% of the stoichiometric val. The deficiency is independent of $[\text{NH}_3]$ and concn. of 8-hydroxyquinoline (I) when the proportion is <2.5 mols. of (I) : 1 g.-atom of Pb (cf. A., 1929, 164). J. G. A. G.

Determination of lead peroxide. J. N. MRGUICH and G. L. CLARK (Ind. Eng. Chem. [Anal.], 1937, 9, 256—258).—The Lux method has been modified by replacing HNO_3 with HClO_4 and KMnO_4 with $\text{Ce}(\text{SO}_4)_2$ and observing the end-point electro-metrically. E. S. H.

Determination of lead in alloys.—See B., 1937, 684.

Analysis of red lead.—See B., 1937, 699.

Quantitative spectral analysis of lead, tin, and cobalt. R. BRECKPOT (Ann. Soc. Sci. Bruxelles, 1937, 57, B, 129—140; cf. A., 1936, 180; B., 1937, 50).—Data for the spectral determination of Tl and Bi in Pb, of Cu, Pb, Fe, As, Sb, and Cd in Sn, and of Ni, Fe, Mn, Cu, Zn, Al, Pb, Ag, Mg, Ca, and Si in Co are tabulated and discussed. N. M. B.

Reaction of copper salts and hydrobromic acid and its application to the microchemical detection of cupric cation. S. AUGUSTY (Mikrochem., 1937, 22, 139—145).—Addition of 2 c.c. of saturated aq. KBr + 1 c.c. of H_2SO_4 to a solution containing Cu produces a reddish-violet ring at the interface. The reaction may be carried out microchemically on a clock-glass with 25% HBr. Ag, Pb, Cu, Hg, Cd, Fe⁺⁺⁺, and Cl interfere. J. S. A.

Microchemical analysis of very small grains. M. REY and M. ZEICHER (Bull. Soc. chim. Belg., 1937, 46, 173—177).—The material, spread on a glass plate, is attacked by exposure to HCl or HNO_3 vapour. A second glass plate, coated with gelatin (or a piece of photographic paper freed from Ag salts) and impregnated with a sp. reagent (e.g., K_2COS_2 for Cu) is placed in contact with the material. In the presence of the material sought, each grain leaves a more or less intensely coloured spot. In favourable cases (e.g., Ni with dimethylglyoxime) the size of the spot forms a semi-quant. measure of the amount present. J. S. A.

Potentiometric determination of copper in steel.—See B., 1937, 681.

Determination of copper in coloured glasses.—See B., 1937, 670.

Determination of copper.—See B., 1937, 682.

Determination of copper cyanide electrolytes.—See B., 1937, 683.

Analysis of brass, bronze, etc.—See B., 1937, 683.

Determination of small amounts of mercury in ores.—See B., 1937, 685.

Application of X-ray spectroscopic method to chemical analysis of the rarer elements. V. Determination of samarium in rare-earth mixtures. S. SHINODA (J. Chem. Soc. Japan, 1935, 56, 1483—1486; cf. A., 1935, 1338).—The intensities of the L_{α_1} line of Sm and the line of Nd are equal when $\text{Sm}_2\text{O}_3 : \text{Nd}_2\text{O}_3 = 0.646$. CH. ABS. (e)

Application of luminescence to quantitative analysis: micro-determination of samarium. M. SERVIGNE and E. VASSY (Compt. rend., 1937, 204, 1566—1568; cf. this vol., 63, 328).—The Sm is brought into solid solution in Ca tungstate and, after grinding, micro-crystals of about equal size are selected. The intensity of the Sm bands in the luminescence spectrum of the Ca tungstate \propto the [Sm] and can be utilised for determining Sm. J. W. S.

Test paper for aluminium. W. E. THRUN (J. Chem. Educ., 1937, 14, 281).—The aluminon test is adapted. L. S. T.

Alkalimetric determination of aluminium in presence of salts of monohydroxy-acids. II. A. V. PAVLINOVA (J. Appl. Chem. Russ., 1937, 10, 732—739).—Tartronic or salicylic acid may be used in place of lactic or citric acid, in the method previously described (this vol., 47). R. T.

Determination of aluminium and alumina in steels.—See B., 1937, 681.

Quantitative spectral analysis of aluminium and its alloys.—See B., 1937, 686, 687.

Reaction for manganese. E. JENSEN (Z. anal. Chem., 1937, 109, 178—180).—The material is dissolved in acid, and treated with 2 vols. of conc. HCl. 4 vols. of 1:1 Et₂O + HCl are added, and then a few crystals of KClO₃. In presence of Mn the solution becomes green. Increased sensitivity is attained by evaporating the HCl solution, moistening the residue with HNO₃, and then adding Et₂O-HCl; limit, 0.005 mg. J. S. A.

Potentiometric determination of manganese, chromium, vanadium, molybdenum, and titanium in steels.—See B., 1937, 681.

Determination of manganese in ores and in ferromanganese.—See B., 1937, 685.

Analysis of manganese ores.—See B., 1937, 665.

Spectrophotometric determination of iron in ores.—See B., 1937, 678.

Colorimetric determination of cobalt in soils and animal organs.—See B., 1937, 706.

Sensitivity of borax and microcosmic beads for detection of cations. S. AUGUSTI and V. PASCALINO (Mikrochem., 1937, 22, 159—167).—Bead tests are sufficiently sensitive for the microchemical detection of Cr, Co, and Cu only. For Cu, the sensitivity is much enhanced by adding to the bead a fragment of SnCl₂, and then heating in the oxidising and reducing flames. J. S. A.

Detection of molybdenum in steel.—See B., 1937, 681.

Formation of tin hydride in the reduction of hydrochloric acid solutions of tin, in quantitative analysis. I. P. ALIMARIN and R. E. AREST-JAKUBOVITSCH (J. Appl. Chem. Russ., 1937, 10, 920—923).—Reduction of 0.1 g. of Sn^{IV} in HCl by Zn or Al involves loss of about 10⁻⁵ g. of Sn as SnH₄, whilst with Mg the loss is 5 × 10⁻⁵ g. Dissolution of Sn-Mg-Zn alloys in HCl involves significant loss of Sn as SnH₄. R. T.

Potentiometric determination of titanium, iron, and molybdenum in ores, slags, and ferro-titanium.—See B., 1937, 685.

Determination of zirconium in steels.—See B., 1937, 681.

Phosphotungstate method for vanadium [determination]. Spectrophotometric study. E. R. WRIGHT [with M. G. MELLON] (Ind. Eng. Chem. [Anal.], 1937, 9, 251—254).—The solution recommended contains 0.025*M*-Na tungstate, 0.5*M*-H₃PO₄, and 0.6*N*-HNO₃, -H₂SO₄, -HCl, or -HClO₄. Procedure for application to the determination of V in alloy steels is described. E. S. H.

Electrometric determination of vanadium and of small amounts of chromium in steel.—See B., 1937, 681.

Determination of bismuth in brass, copper, and zinc.—See B., 1937, 683.

Electrical laboratory tube furnace with granulated carbon (kryptol) resistance heating for

high temperatures (1600°). I. TRIFONOV, D. MIREV, and G. TOSCHEV (Österr. Chem.-Ztg., 1937, 40, 315—316).—In a sheet-Fe cylinder packed with 2 kg. of kryptol is fixed a horizontal heating tube on each side of which is a pair of horizontal C electrodes. With a current of 150 amp., stepped down from 220 to 30 volts, a temp. of 1600° can be attained in <1 hr. C. R. H.

Micro-oven. F. PAVELKA (Mikrochem., 1937, 22, 247—250).—A form of oven for micro-beakers, -crucibles, etc. made from Al blocks separated by insulating sheet, and giving graded temp. between 40° and 320°, is described. J. S. A.

Use of overhead heating in analytical laboratories. II. F. HEINRICH and F. PETZOLD (Chem.-Ztg., 1937, 61, 568; cf. A., 1936, 445).—The advantages and energy efficiency of evaporating and heating liquids by an immersion heater are discussed. J. S. A.

Thermal conductivity of synthetic substances. S. ERK, A. KELLER, and H. POLTZ (Physikal. Z., 1937, 38, 394—402).—Apparatus for a comparison method of determining the thermal conductivity of bad conductors is described. The standard substance was a glass plate, of which the conductivity was previously determined by an abs. method. The densities and thermal conductivities of 46 synthetic plastics are recorded. A. J. M.

Search for high-efficiency light sources. S. DUSHMAN (J. Opt. Soc. Amer., 1937, 27, 1—24).—A review and discussion. H. J. E.

Measurement and interpretation of fibre diffraction patterns. G. L. CLARK and A. F. SMITH (Rev. Sci. Instr., 1937, [ii], 8, 199—201).—An instrument for measuring the positions of interferences on fibre patterns, and a machine for the evaluation of unit cell size and the indexing of interferences on diffraction patterns, are described. N. M. B.

Recording microphotometer. H. V. KNORR and V. M. ALBERS (Rev. Sci. Instr., 1937, [ii], 8, 183—184).—A new instrument giving an inked record, and using a photo-electric cell as the light-sensitive device, is described. N. M. B.

Improvements in the integrating photometer for X-ray crystal analysis. R. H. V. M. DAWTON (J. Sci. Instr., 1937, 14, 198—200).—Improvements include the substitution of a mechanical clutch with magnetic release for the original magnetic clutch. N. M. B.

Polarisation spectrometer for investigation of surface films on metals. A. B. WINTERBOTTOM (J. Sci. Instr., 1937, 14, 203—208).—The construction, adjustment, and calibration of an instrument provided with a Senarmont compensator and an ellipticity half-shade system, and methods of prep. and examination of surfaces when determining optical consts. or surface films, are described. N. M. B.

Theory and design of the cam of an oscillating-crystal X-ray spectrograph. S. H. YU (Z. Krist., 1937, 96, 1—6).—A theoretical deduction of the necessary cam shape is given. B. W. R.

Determination of refractive indices of melts. L. KOFLER (Mikrochem., 1937, 22, 241—246).—An

immersion method using glass powders of known n , mixed with the melt, as standards of reference, is employed. J. S. A.

Electrophotometer of barrier-layer [photo-] cells for colorimetry and opacimetry. P. MEÜNIER (Bull. Soc. Chim. biol., 1937, 19, 113—118; cf. A., 1936, 445). F. O. H.

Regularities and characteristic properties of resistance [photo-]cells. O. P. FUCHS and H. KOTTAS (Z. tech. Phys., 1936, 17, 47—54; Chem. Zentr., 1936, i, 3461).—Characteristic cell consts. are derived from the relation of Vieweg and Pfestorf. J. S. A.

Development of photo-electric cells.—See B., 1937, 693.

Innovations in microscopy. A. KUFFERATH (Woch. Brau., 1937, 54, 197—200).—Modern equipment and processes for photomicrography are described and discussed. I. A. P.

Measurement of extra hard X-rays and gamma rays in Roentgens. G. C. LAURENCE (Canad. J. Res., 1937, 15, A, 67—78).—The intensity in Roentgens per sec. of X-rays or γ -rays harder than 0.03 A. may be measured with a small thimble chamber with homogeneous walls of elements of at. no. <13 and thick enough to prevent the passage of β -rays. W. R. A.

Production of cathode-ray tube screens. H. W. LEVERENZ (J. Opt. Soc. Amer., 1937, 27, 25—35).—A review of the production and properties of various types of screen. H. J. E.

Potentiometer for measuring small electromotive forces and resistances. C. H. JOHANSSON (J. Sci. Instr., 1937, 14, 194—198).—An instrument, modified in order to reduce disturbing thermoelectric forces, is described. N. M. B.

Geiger-Müller counters. P. B. MOON (J. Sci. Instr., 1937, 14, 189—193).—A review of the mechanism of the instrument, modifications of the basic circuit designed to control the behaviour, and recent developments of special types for sp. purposes. N. M. B.

Low-resistance glass electrodes. H. MOUQUIN and R. L. GARMAN (Ind. Eng. Chem. [Anal.], 1937, 9, 287).—Procedure for making the electrodes is described. E. S. H.

Errors of the glass electrode. W. C. GARDINER and H. L. SANDERS (Ind. Eng. Chem. [Anal.], 1937, 9, 274—278).—At temp. $>30^\circ$ the glass electrode deviates from the H_2 electrode over the whole p_H range. The deviations increase with rise of temp. and are influenced by the $[Na^+]$. Correction curves for two commercial types of glass electrode have been worked out. The theoretical implications are discussed. E. S. H.

Universal cell for electrolysis. V. SIHVONEN (Suomen Kem., 1937, 10, B, 13).—The middle portion of an H-shaped cell is attached by means of rubber bands, and its open ends may be provided with parchment paper diaphragms. M. H. M. A.

Apparatus for measuring the total normal thermal emissivity of sheet materials in the

range $60-260^\circ$. P. F. McDERMOTT (Rev. Sci. Instr., 1937, [ii], 8, 185—192).—A radiometer for measurements accurate to $\pm 1\%$ of black-body emission on sheet material up to $\frac{3}{8}$ in. thick, without contact or damage to the surfaces, is described. A table of results for 16 surfaces with comparative available vals. is given. N. M. B.

200 kv. neutron source. C. M. SLACK and L. F. EHRKE (Rev. Sci. Instr., 1937, [ii], 8, 193—196; cf. Tuve, A., 1935, 1185).—The tube described for the utilisation of the D-D reaction embodies a capillary arc ion source and a target of heavy ice. The activation in Ag by the neutrons produced with 280 microamp. of unresolved ions at 200 kv. was 10 times that due to a 200 millicurie Rn-Be source. N. M. B.

Absolute method for measuring the dielectric constants of fluids and solids at ultra-high frequencies. R. KING (Rev. Sci. Instr., 1937, [ii], 8, 201—209).—A new parallel-wire method gives results depending only on the λ at which measurements are made, the thickness of the sample in the form of a thin slab, and a bridge shift along the parallel wires measured in air. This relation is derived, the method is outlined, and results with H_2O and $EtOH$ are given. N. M. B.

Rigid support for heated filaments. M. Fox (Rev. Sci. Instr., 1937, [ii], 8, 220).—A mass spectrograph is fitted with a helical filament of 6-mil W wire wound on a cylinder of synthetic sapphire 1 mm. diameter and 1 cm. long; this is supported at the ends in holes in the stout conductors carrying the current. N. M. B.

Micro-burette. A. FRIEDRICH (Mikrochem., 1937, 22, 251—253). J. S. A.

Maintenance of correct values on laboratory weights. W. M. THORNTON, jun. (J. Chem. Educ., 1937, 14, 270—274).—Possible sources of alteration in the masses of wts. of the screw-knob type are discussed, and a modification of Richards' method of calibration is described. L. S. T.

Fundamentals of micro-weighing technique. H. STERNBERG (Mikrochem., 1937, 22, 187—201).—Factors affecting the accuracy of weighings, arising from changes in zero, temp., and humidity, electrostatic charges, and changes in buoyancy correction are exhaustively discussed. J. S. A.

Niobates. P. SUE (Ann. Chim., 1937, [xi], 7, 493—592).—Previous work (A., 1933, 585; 1934, 742; 1935, 825; 1936, 575, 690, 1070; this vol., 41) is summarised. Apparatus for recording the evolution of CO_2 when Nb_2O_5 is heated with alkali carbonates is described. F. L. U.

Vacuum flask method of technical gas analysis.—See B., 1937, 666.

Capillary viscosimeters. W. PHILIPPOFF (Arch. Tech. Mess., 1937, No. 69, 34—35r).—Various types are illustrated. R. B. C.

Electro-dialyser. G. SANKARAN (Indian J. Med. Res., 1935, 23, 219—222).—A simple form of apparatus is described. R. N. C.

Ionic and mol. wts. by dialysis. H. BRINTZINGER (Z. anorg. Chem., 1937, 232, 415—422).—Apparatus and procedure are described. F. J. G.

Direct determination of low vapour pressures. K. C. D. HICKMAN, J. C. HECKER, and N. D. EMBREE (Ind. Eng. Chem. [Anal.], 1937, 9, 264—267).—Two tensimeter-hypsometers for determining v.p. of substances over the range 0.001—4.0 mm. are described. Data are given for the vac.-pump fluids, two sterols, and a dye. E. S. H.

Multiple-column mercury manometer for pressures to 200 atmospheres. J. R. ROEBUCK and W. CRAM (Rev. Sci. Instr., 1937, [ii], 8, 215—220).—An improved steel manometer consisting of 9 columns of Hg alternating with 8 of PhMe, and accurate to 1 in 10,000 at 200 atm., is described. N. M. B.

Direct registration of variations of superficial pressure as a function of the surface and temperature (unimolecular layers). D. G. DERVICHIAN (J. Phys. Radium, 1935, [vii], 6, 221—225).—An apparatus for the photographic recording of variations of surface tension of thin films is described. A. J. M.

Apparatus for the preparation of doubly distilled water. E. C. H. J. NOYONS (Chem. Weekblad, 1937, 34, 434).—Tap-H₂O is distilled into a second distillation flask from which it is distilled into a suitable receiver. The apparatus is semi-automatic. S. C.

Carbon dioxide generator for the micro-Dumas determination of nitrogen. E. B. HERSHBERG and G. W. WELLWOOD (Ind. Eng. Chem. [Anal.], 1937, 9, 303).—The generator is designed to work with commercial solid CO₂. E. S. H.

Micro-determination of density by the falling-drop method. S. HOCHBERG and V. K. LAMER (Ind. Eng. Chem. [Anal.], 1937, 9, 291—292).—Apparatus and technique for determining the d of aq. solutions to ± 0.0001 are described. E. S. H.

Microchemical balance room. W. R. KIRNER (Ind. Eng. Chem. [Anal.], 1937, 9, 300—303).—The construction of the room and the methods employed for dust removal, vibration-free mounting of the balances, heat-free illumination, and humidity and temp. control are described. E. S. H.

Storage of carbon dioxide from "dry ice" for Dumas determinations. W. H. HAMILL and J. A. ALICINO (Ind. Eng. Chem. [Anal.], 1937, 9, 290).—The gas is stored under slight pressure in 40-litre carboys. E. S. H.

Paper as a medium for analytical reactions. I. Improvements in the spot test technique. B. L. CLARKE and H. W. HERMANCE (Ind. Eng. Chem. [Anal.], 1937, 9, 292—294).—Modifications by the use of a capillary burette and thin, close-textured papers impregnated with reagents that have a low-solubility in the liquids under test are described. E. S. H.

Apparatus for removal of liquid and indicator for characterisation of filtrate in P₂O₅ determination. J. KRÓLIKOWSKI (Uprawa Rós. Nawóz., 1935, 7, 510—511; Chem. Zentr., 1936, i, 3371—

3372).—Modifications of the Lorentz method are described. J. S. A.

Extraction apparatus. G. KUBICZEK (Chem. Fabr., 1937, 10, 231—232).—A simple apparatus in which liquids and liquid-solid mixtures, as well as solids, may be extracted is described. Two types, for solvents (A) lighter, and (B) heavier, than the liquid to be extracted, both contain a (removable) device consisting of a glass tube, one end of which is funnel-shaped and the other formed into a perforated ring. In (A), solvent, as it drops from the condenser, is distributed below the sample, through which it rises to be returned by a siphon to the extraction flask. In (B), solvent is distributed above the sample and collects below it, to be siphoned back to the flask. I. C. R.

Apparatus for producing pure hydrogen [for hydrogen electrodes]. P. GESTEAU (J. Pharm. Chim., 1937, [viii], 25, 11—17).—Dil. H₂SO₄ is electrolysed in a vessel in which the Pt electrodes are enclosed in long tubes, open at the bottom; H₂ formed is washed by alkaline pyrogallol and by H₂O before passing, through a tap, to the H₂ electrode. The electric current is kept on; when the tap is closed, pressure of H₂ forces the electrolyte down and breaks the circuit. The const. pressure of H₂ prevents the entry of air. E. W. W.

Universal micro-desiccator. P. ROSCHEISEN and P. BRETTNER (Mikrochem., 1937, 22, 254—257). J. S. A.

Method for sealing β -magnesia windows into steel spectroscopic absorption furnaces and a needle valve for controlling the evacuation of such furnaces. R. T. BRICE (Rev. Sci. Instr., 1937, [ii], 8, 209—212).—The windows are sealed into heavy steel tubes by mechanical pressure of a 1° taper fit-on on Al or Cu bands and the window units are sealed into a furnace by means of Al, Cu, or Ni gaskets. A stainless steel needle valve and seat, operating at furnace temp., and controlling an evacuation port in the side of a vac. furnace, is described. N. M. B.

Improvement in filter tubes with glass frit. F. CANAL (Mikrochem., 1937, 22, 250).—A constriction above the filter plate holds the asbestos bed in place. J. S. A.

Apparatus for filtration under reduced pressure on the micro- and semi-micro-scale. M. ARNOUX (Bull. Soc. Chim. biol., 1937, 19, 760—762). P. W. C.

Apparatus for hot extraction. S. M. STREPKOV (Z. anal. Chem., 1937, 109, 262—266).—A universal apparatus, permitting the vol. of oil, H₂O, etc. extracted to be measured, is described. J. S. A.

Periodic system of the elements in a new form. E. W. ZMACZYNSKI (J. Chem. Educ., 1937, 14, 232—235).—The elements are arranged on the surface of a cone divided into 32 small sectors which are joined in groups of 8 into four large sectors. Advantages of the new arrangement are pointed out. L. S. T.

Fictions in chemistry. A. MITTASCH (Angew. Chem., 1937, 50, 423—433).—A discussion of the use and utility of pictures, symbols, and metaphors. F. L. U.

Demonstration experiments using universal indicators. L. S. FOSTER and I. J. GRUNTFEST (J. Chem. Educ., 1937, 14, 274—276). L. S. T.

[Laboratory experiments in chemiluminescence.] E. W. COTTMAN (J. Chem. Educ., 1937, 14, 236—237).—Details for producing chemiluminescence

by the oxidation of triphenylglyoxaline (I) are given. Aq. or EtOH extracts of coffee, tea, mustard, yeast, fused carbohydrates, etc. can replace (I). L. S. T.

Fritz Haber. E. BERL (J. Chem. Educ., 1937, 14, 203—207).—Biographical. L. S. T.

Geochemistry.

Eclipses of the moon, and the distribution of atmospheric ozone. B. FESSENKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 119—121).—From the intensity of the earth's shadow on the moon it is inferred that O_3 is present at 20—30 km. from the earth's surface. R. S. B.

Geochemical investigations of volcanoes in Japan. I. Gases and spring waters of the volcano Asama. I. K. NOGUCHI. II. Chemical composition of the lavas of the volcano Oshima, Izu. I. IWASAKI (J. Chem. Soc. Japan, 1935, 56, 1495—1510, 1511—1522). CH. ABS. (e)

Geothermal stages and the chemistry of artesian waters of N. Daghestan. I. I. TSCHEBOTAREV (Razvedka Nedr, 1935, 5, No. 3, 23—26). CH. ABS. (e)

Carotenoids and other lipoid-soluble pigments in the sea and in deep marine mud. D. L. FOX (Proc. Nat. Acad. Sci., 1937, 23, 295—301).—Suspensions in sea- H_2O and marine mud have been analysed for carotenoids and the results are discussed. W. R. A.

Mineral names. L. J. SPENCER (Amer. Min., 1937, 22, 682—685).—A discussion. L. S. T.

Geochemistry and the theory of metallurgy. A. F. KAPUSTINSKI (Sotz. Rekonstr. i Nauk., 1935, No. 5, 22—43).—A discussion. CH. ABS. (e)

Mejonite of Somma-Vesuvius. A. SCHERILLO (Period. Min., 1935, 6, 227—239; Chem. Zentr., 1936, i, 3293).—Crystallographic data are recorded. Mejonite is tetragonal, space-group C_{4h} , with a 12.24, c 7.59 Å. J. S. A.

Geochemistry of caustobiolites. N. A. ORLOV and V. A. USPENSKI (Chim. Tverd. Topl., 1934, 5, 663—679). CH. ABS. (e)

Luminescence of certain minerals. S. KREUTZ (Bull. Acad. Polonaise, 1936, A, 501—509).—The fluorescence of willemite weakens above 160°, and disappears below 480°. The fluorescence of a violet fluorite showed two spectral regions of emission at —180°. The colour of the material, but not its fluorescence, was destroyed on heating. The effect of heating on the fluorescence of calcites from different sources is described. J. S. A.

Alteration of fluorescence colours on fresh cleavage surfaces of calcite. K. OBENAUER (Zentr. Min., 1935, A, 357—361; Chem. Zentr., 1936, i, 2899).—The pink fluorescence from cleavage faces of native calcite crystals (source indicated) disappeared when fresh cleavage faces were prepared. J. S. A.

Crystallography of axinite and the normal setting of triclinic crystals. M. A. PEACOCK (Amer. Min., 1937, 22, 588—624).—X-Ray investigations give for the elements of the structural lattice of axinite in normal setting a_0 7.151, b_0 9.184, c_0 8.935 Å., α 91° 52', β 98° 09', γ 77° 19', in good agreement with vals. of the elements of the morphological lattice. The unit cell contains $H_2B_2Al_4Ca_4(Mn,Fe)_2Si_8O_{30}$; d_{calc} . 3.316, n_x 1.683, n_y 1.688, n_z 1.692 (all ± 0.002). L. S. T.

Morphology of gordonite. F. H. POUGH (Amer. Min., 1937, 22, 625—629).—Gordonite, $MgO, Al_2O_3, Fe_2O_3, 9H_2O$, from Fairfield, Utah, has $a:b:c = 0.5192:1:0.6942$, α 109° 27', β 110° 57½', and γ 71° 40½'. L. S. T.

Babingtonite. W. E. RICHMOND, jun. (Amer. Min., 1937, 22, 630—642).—Babingtonite (I) from Woburn, Mass., is triclinic with $a:b:c = 0.6417:1:0.5746$, α 91° 31', β 93° 51', γ 104° 04'. X-Ray measurements give a_0 7.39, b_0 11.52, c_0 6.61 Å., α 91° 48', β 93° 48', γ 103° 54'; $a_0:b_0:c_0 = 0.642:1:0.574$. The unit cell contains $Fe^{III}_2Fe^{II}_2Ca_4Si_{10}O_{38}(OH)_2$. n_x is 1.720, n_y 1.731, and n_z 1.753 (all ± 0.003). (I) and rhodonite form a group of structurally related pyroxenoids, which shows only partial relationships to the wollastonite group. L. S. T.

Distinction between enargite and famatinite (luzonite). G. A. HARCOURT (Amer. Min., 1937, 22, 517—525).—X-Ray powder diffraction patterns and spectrographic intensity data for minute specimens of minerals of the enargite group from different localities show that the enargite (I) structures are rich in As and those of luzonite (II) rich in Sb, and that the proportions of As to Sb do not overlap for the two series. The proportion of Sb in Cu_3AsS_4 may increase only up to a definite amount and the (I) crystal structure may still be retained, and similarly with the proportion of As in Cu_3SbS_4 and the (II) structure. The second series should be named the famatinite (III) series. The diffraction pattern of (III) (luzonite) is closely similar to those of germanite and colusite, and hence (III) has the sphalerite type of structure. The structural relations of (I) and (III) are thus analogous to those of sphalerite and wurtzite. L. S. T.

Synadelphite and plumbosynadelphite. C. S. HURLBURT, jun. (Amer. Min., 1937, 22, 526—533).—Synadelphite (I) from Långban is a practically colourless mineral with a red coating of different material. X-Ray examination shows that (I) is orthorhombic with a_0 9.91, b_0 18.70, c_0 10.65 Å., unit cell vol. 1962 Å.³, mol. wt. 4246, and d 3.57. The colourless interior

contains [F. A. GONYER] SiO_2 1.45, As_2O_5 26.89, Al_2O_3 1.41, Fe_2O_3 0.86, MnO 53.10, CaO 1.55, MgO 4.62, K_2O 0.79, Na_2O 0.62, H_2O 8.52, total 99.81%; n_x is 1.750, n_y 1.751, and n_z 1.761. The red coating on (I) is a new variety which is now named plumbosynadelphite (II), d 3.79, hardness 4, 1.851, n_x 1.864, n_z 1.894. The analysis of (II) is similar to that of (I), except for the presence of 3.24% of PbO . X-Ray photographs show a difference in structure.

L. S. T.

Dakeite, a new uranium mineral from [Wamsutter,] Wyoming. E. S. LARSEN, jun., and F. A. GONYER (Amer. Min., 1937, 22, 561—563).—Dakeite (I), d 2.51, hardness 2.5 approx., n_x 1.489 ± 0.002 , n_y 1.542 ± 0.001 , n_z 1.542 ± 0.001 , occurs in greenish-yellow aggregates of micaceous plates disseminated throughout gypsite. The analysis, CaO 18.31, Na_2O 7.31, UO_3 30.27, CO_2 13.71, SO_3 9.61, H_2O 19.95, insol. 1.06, total 100.22%, corresponds with $3\text{CaCO}_3 \cdot \text{Na}_2\text{SO}_4 \cdot \text{UO}_3 \cdot 10\text{H}_2\text{O}$. (I) is sol. in acid and in H_2O at room temp.; on treatment with H_2O for 15 hr. at 85° , it is decomposed leaving an insol. residue of calcite and a yellow U compound. (I) is strongly fluorescent in ultra-violet light, but is not appreciably phosphorescent. It is only weakly radioactive for its high U content.

L. S. T.

Sulphate incrustations in the Copper Queen Mine, Bisbee, Arizona. H. E. MERWIN and E. POSNJAK (Amer. Min., 1937, 22, 567—571).—The disposition and conditions of growth of these sulphates at the surface of the rock impregnated with Cu-bearing sulphides and pyrite are described. They consist of coquimbite, voltaite, roemerite, rhombo-clase, copiapite, chalcantite, and kornelite.

L. S. T.

Morphology of monazite. R. L. PARKER (Amer. Min., 1937, 22, 572—580).

L. S. T.

Paragenesis and colour of fluorite in the English Pennines. K. C. DUNHAM (Amer. Min., 1937, 22, 468—478).—The relationships between fluorite and its associated minerals in the N. Pennines are discussed. The purple and green varieties crystallised at a higher temp. than the amber.

L. S. T.

Carminite and associated minerals from Mapimi, Mexico. W. F. FOSHAG (Amer. Min., 1937, 22, 479—484).—The carminite occurs in minute crystals in cavities in either scorodite or arseniosiderite, and also forms heavy masses mixed with cerussite, anglesite, and plumbogjarosite. The analyses given indicate the formula

$\text{PbO} \cdot \text{Fe}_2\text{O}_3 \cdot \text{As}_2\text{O}_5 \cdot \text{H}_2\text{O}$. Carminite is dark carmine-red in colour, pleochroic, biaxial, positive with α 2.070, β 2.070, and γ 2.080, and parallel elongation. The scorodite, As_2O_5 48.96, Fe_2O_3 34.20, Al_2O_3 1.60, CaO 0.54, MgO 0.22, H_2O 14.53, insol. 0.12, total 100.17% [F. A. GONYER], has α 1.787, β 1.795, and γ 1.810. The analysis given for the arseniosiderite agrees with the formula $3\text{CaO} \cdot 2\text{Fe}_2\text{O}_3 \cdot 2\text{As}_2\text{O}_5 \cdot 6\text{H}_2\text{O}$.

L. S. T.

Silicate-water systems: the "osmotic pressure" of silicate melts. R. W. GORANSON (Amer. Min., 1937, 22, 485—490).—Theoretical. The evaluation of the solubility of H_2O in silicate melts when the

hydrostatic pressure is not the same on the two phases, H_2O and silicate solution, is discussed. Data for the system albite- H_2O solution are given and discussed in relation to volcanic activity and to the behaviour when heated of rock glasses of high H_2O content.

L. S. T.

Vein quartz pseudomorphs of cross-fibre asbestos in Virginia. L. R. THIESMEYER (Amer. Min., 1937, 22, 701—719).—A discussion of the fibrous habit indicates that some minerals are commonly asbestiform owing to intramol. forces peculiar to them, whilst others acquire it through special conditions of growth. Fibrous quartz is more common than is generally supposed; it is not restricted to any type of rock, mineral assemblage, or location, and it is always of secondary origin. Occurrences are described.

L. S. T.

Accessory minerals of igneous rocks. J. H. TAYLOR (Amer. Min., 1937, 22, 686—700).—Methods of separating the heavy accessory minerals of igneous rocks are discussed. The tabulated data for the Mourne Mountains granite complex show that the degree of variation between the accessory mineral suites from the four intrusions is of the same order as that between different samples of any one of the intrusions, as regards both the occurrence of mineral species and their varietal characteristics. Both the nature of the zircon and the quantity of fluorite present appear to be considerably affected by the distance from the roof of the intrusion.

L. S. T.

Pyroxmangite from Invernesshire, Scotland. C. E. TILLEY (Amer. Min., 1937, 22, 720—727).—Pyroxmangite from Glenelg has SiO_2 47.44, Al_2O_3 0.66, Fe_2O_3 1.45, FeO 15.02, MnO 28.25, MgO 4.56, CaO 3.00, total 100.38% [(Miss) H. BENNETT], α 1.732, β 1.735, and γ 1.750, d 3.63. The relations existing between Mn-bearing compounds in the system MnSiO_3 - FeSiO_3 - CaSiO_3 , and between pyroxmangites and Mn-Fe-Ca slags are discussed.

L. S. T.

[Crystallographic] re-orientation of roemerite. C. W. WOLFE (Amer. Min., 1937, 22, 736—741).

L. S. T.

Hastingsite in theralite from the Crazy Mountains, Montana. J. E. WOLFF (Amer. Min., 1937, 22, 742—744).—Hastingsite (I), SiO_2 48.51, TiO_2 1.32, Al_2O_3 6.60, Fe_2O_3 4.09, FeO 9.48, MnO 0.19, MgO 14.79, CaO 5.60, Na_2O 6.01, K_2O 2.20, H_2O + 1.47, total 100.26% [F. A. GONYER], has the constitution $(\text{Na}, \text{K})_2\text{Ca}(\text{Mg}, \text{Fe}^{\text{II}}, \text{Fe}^{\text{III}}, \text{Al}, \text{Ti})_5(\text{Al}, \text{Si})_8(\text{OH})_2\text{O}_{22}$ in which $\text{Mg}/\text{Fe}^{\text{II}} = 2.8$, $\text{Al}/\text{Fe}^{\text{III}} = 2.5$, and $\text{Na}/\text{K} = 4.2$. Optical properties of (I) and an analysis of theralite are given.

L. S. T.

Manganiferous prochlorite from Hawleyville, Conn. W. M. AGAR and E. H. EMENDORFER (Amer. J. Sci., 1937, [v], 34, 77—80).—Veins of pink albite with bunches of dark green chlorite occur in granitised sediments. The chlorite shows unusual interference tints, perhaps due to the presence of Mn (MnO 0.4, FeO 24.7%). The albite also contains Mn (MnO 0.03, Fe_2O_3 0.43%).

L. J. S.

Radioactivity of the Deccan traps. I. Basalts. V. S. DUBEY and M. P. BAJPAI (Amer. J. Sci., 1937, [v], 34, 24—29).—As determined by the dissolution

method (in $\text{HF} + \text{H}_2\text{SO}_4$) these basalts contain on an average $\text{Ra } 0.56 \times 10^{-12}$ g. per g. and $\text{Th } 0.59 \times 10^{-5}$ g. per g., with little variation in successive lava flows. The results are rather lower for Ra and higher for Th than those obtained by the fusion method by Poole and Joly (1924). These rocks are richer in Ra and Th than older rocks of the same character.

L. J. S.

Floor of the Arabian Sea. J. D. H. WISEMAN and R. B. S. SEWELL (Geol. Mag., 1937, 74, 219—230).—Chemical analyses of three sub-marine basalts are recorded and compared with the average of the Deccan Trap in India. The Ra content of these sub-marine basalts is approx. one half of that of the land basalts.

L. S. T.

Replacement breccias of the Lower Keechelus. G. E. GOODSPEED and H. A. COOMBS (Amer. J. Sci., 1937, [v], 34, 12—23).—The rocks of the Keechelus formation of Tertiary age in the Cascade Ranges of Washington have been thought to be of pyroclastic origin. They show dark brown fragments of sedimentary rock in a greyish-green matrix which also contains remnants of sedimentary material. Analyses of these two portions show an increase of SiO_2 and K_2O and a decrease of Fe_2O_3 , FeO , MgO , and CaO in the matrix, the composition of which is very similar to that of a dacite. It is suggested that sandy shales invaded by granodiorite and intensely folded underwent recrystallisation replacement by a process of additive hydrothermal metamorphism.

L. J. S.

Titanite and tilasite. (The relationship of the silicates to the phosphates and arsenates.) H. STRUNZ (Z. Krist., 1937, 96, 7—14).—Powder photographs gave for tilasite, MgCaFAsO_4 , a_0 6.66 b_0 8.95 c_0 7.56, β 121°, space-group probably C_2^2 . Goniometrically titanite, TiCaOSiO_4 , is very similar, and it has the same space-group; the two compounds are isotypes. The relationships between SiO_4 , PO_4 , and AsO_4 in such compounds are summarised.

B. W. R.

Tantalite deposits in S.W. Uganda. ANON. (Bull. Imp. Inst., 1937, 35, 180—184).—Grains and crystals of tantalite, often associated with cassiterite, occur in quartz veins not far from intrusive masses of granite.

L. J. S.

Hyperalkaline rocks of Egypt. G. ANDREW (Bull. Soc. Franc. Min., 1936, 59, 338—346).

L. S. T.

Boehmite. S. GOLDSZTAUB (Bull. Soc. Franç. Min., 1936, 59, 348—350).—Comparison of the X-ray diagrams of lepidocrocite and artificial boehmite gives for the latter a 3.78, b 11.8, and c 2.85 Å.

L. S. T.

Dehydration curves of minerals. H. LONG-CHAMON (Bull. Soc. Franç. Min., 1936, 59, 145—161).—Factors affecting the dehydration curves of minerals are discussed. The method described involves heating the mineral in air, saturated at 15°, at regularly increasing temp. and automatically recording the loss in wt. that results. Curves for kaolinite, steatite, and polygorskite are reproduced.

L. S. T.

Serpentine minerals. (Mlle.) S. CAILLÈRE (Bull. Soc. Franç. Min., 1936, 59, 163—326).—Theories

of serpentinisation and previous work on the properties of the serpentines are first briefly reviewed. The physical and chemical properties of the following samples from different localities are described: antigorite, metaxite, picrolite, schweitzerite, dermantine, picrosminite, bowenite, williamsite, deweylite, and chrysotile. Chemical analyses are summarised. The action of heat on these minerals and their dehydration in a vac. are discussed, together with X-ray analyses of the original minerals and of the products formed after heating. Numerous ferri-ferrous and nickeliferous types of serpentines are also studied in detail, and an attempt at classification of the serpentine minerals has been made.

L. S. T.

Petrology of katungite. A. HOLMES (Geol. Mag., 1937, 74, 200—219).—Petrography and petrogenesis are discussed and new chemical analyses given.

L. S. T.

Minerals containing rarer elements. Allantite found in Kanbe village, Mara Prefecture. J. TAKUBO and H. UKAWA (J. Chem. Soc. Japan, 1935, 56, 1523—1525).—The composition is $\text{Ca}_2(\text{AlOH})(\text{Al,Ce,Fe})_3(\text{SiO}_4)_3$.

CH. ABS. (e)

Helium, radium, and thorium in beryllium minerals of the U.S.S.R. E. S. BURKSEER, N. P. KAPUSTIN, and V. V. KONDOGURI (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 193—198).—The He content of Be minerals from the Mariupol region is considerably > the total accumulated He production from the U and Th elements contained in them, the ratio of excess He:Be content being approx. const. Hahn's view (A., 1934, 1326) of the γ -ray disruption of the Be nucleus is thereby strengthened.

J. S. A.

Geochemical connexion between helium, lead, and radium occurrences in German salt deposits. H. J. BORN (Kali, 1936, 30, 41—45; Chem. Zentr., 1936, i, 3482).—The occurrence of He is sylvine and rock-salt is interpreted as indicating that both may be of secondary origin from deep H_2O bearing Ra in solution. Ra is not found in H_2O with $[\text{SO}_4^{4-}] > 0.2$, but the [Ra] increases with the Ca and Li. The presence of SO_4^{4-} in deep H_2O indicates dilution with surface H_2O .

J. S. A.

Crystal structure and twinning. H. STRUNZ (Fortschr. Min., 1936, 20, 63; Chem. Zentr., 1936, i, 3478).—Twinning may be conditioned by a layer of inhomogeneity. Diopside twins may form on lamellae of pure $\text{Mg}_2\text{Si}_2\text{O}_6$, epidote on lamellae of zoisite.

Lava from Demavend (Persia). A. SCHERILLO (Period. Min., 1935, 6, 221—225; Chem. Zentr., 1936, i, 3294).—Petrological data are recorded.

J. S. A.

Petrology of Alaid volcano, N. Kurile. H. KUNO (Japan. J. Geol., 1935, 12, 153—162).—The lavas of Alaid Island are of several kinds of olivine-basalt. Those of Taketomi Island consist of a single kind of olivine-anorthite-basalt.

CH. ABS. (e)

Natural sulphidic iron-copper ores, and genetic conclusions. H. BORCHERT (Fortschr. Min., 1936, 20, 32; Chem. Zentr., 1936, i, 3481—3482).—The cubanite (I)-Cu pyrites (II) segregation occurs at 235°, forming a lamellar structure of 40% of (II) with

60% of chalcopyrrhotine, which is metastable below 255°. Ore deposits of the Sudbury type contain no (I) owing to the complete separation of (I) into magnetic pyrites and (II) on slow cooling. Valerite undergoes similar change above 255°. J. S. A.

Chaidarkan mercury-antimony-fluorite deposit. A. I. SULOEV and A. L. PONOMAREV (Trans. All Union Sci. Res. Inst. Econ. Min. U.S.S.R., 1935, No. 71, 5—78).—The deposits are described.

CH. ABS. (c)

The deuteric mineral sequence in the Enoggera granite, Queensland. M. J. WHITEHOUSE (Min. Mag., 1937, 24, 538—546).—The period of main magmatic crystallisation of the granite was followed by pegmatite formation and the initiation of cavities in rock. While the rock was still hot the deuteric period commenced, beginning with the kaolinisation of the feldspars and the chloritisation of the ferromagnesian minerals. Then followed the deposition of chlorite and epidote, the pneumatolytic minerals, some calcite, prehnite, zeolites, and, finally, many of the cavities were completely filled with calcite. A chemical analysis of laumontite is given. L. J. S.

Lawsonite in glaucophane-bearing rocks from New Caledonia. G. A. JOPLIN (Min. Mag., 1937, 24, 534—537).—The schists were derived from dolerite and gabbro, with alteration of the feldspar to lawsonite $[\text{CaO}, \text{Al}_2\text{O}_3, 2\text{SiO}_2, 2\text{H}_2\text{O}]$ and of the augite to chlorite and glaucophane. The lawsonite-glaucophane association in calcic rocks is analogous to the albite-epidote association in alkali rocks. L. J. S.

Occurrence of pumpellyite in New Zealand. C. O. HUTTON (Min. Mag., 1937, 24, 529—533).—Pumpellyite, $6\text{CaO}, 3\text{Al}_2\text{O}_3, 7\text{SiO}_2, 4\text{H}_2\text{O}$, recognised by its distinctive optical characters, is an important constituent of some schists in the Lake Wakatipu region, western Otago. It has been formed together with albite by the alteration of calcic plagioclase under conditions of low-grade dynamo-thermal metamorphism. L. J. S.

Iron-rich optically-positive hypersthene from Manchuria. K. TSURU and N. F. M. HENRY (Min. Mag., 1937, 24, 527—528).—Analysis shows FeO 41.65, MnO 5.02%, corresponding with $(\text{Fe}, \text{Mn})\text{SiO}_3$ 88%; α 1.755, β 1.763, γ 1.773. These figures extend the plot (A., 1936, 185) showing the relation between chemical composition and the optical data.

L. J. S.

X-Ray studies on pyrolusite (including polianite) and psilomelane. G. VAUX [analyses by H. BENNETT] (Min. Mag., 1937, 24, 521—526).—Polianite (MnO_2) from Platten, Bohemia, gives the same X-ray pattern as pyrolusite, which is tetragonal and of the rutile type with a 4.38, c 2.86 Å. Psilomelane is orthorhombic with a 9.1, b 13.7, c 2.86 Å.; detailed analyses give a formula $\text{H}_2\text{R}_2\text{Mn}_3\text{O}_{20}$, where $\text{R} = \text{Mn}, \text{Mg}, \text{Ca}, \text{Ni}, \text{Co}, \text{Cu}$. A certain relation exists between these unit cell dimensions and those of other Mn oxide minerals. L. J. S.

Geochemistry applied to the problems of silicosis. A. BRAMMALL and J. G. C. LEECH (Bull. Inst. Min. Met., 1937, No. 393, 9 pp.).—Extraction of biotite with cold 0.2N-KCl for 4 hr. removes 78%

of the F, 26% of the CaO , 51% of the MgO , and 53% of the Fe_2O_3 . Hydromuscovite shows considerable loss of SiO_2 , alkalis, and Al_2O_3 , Fe_2O_3 , CaO , and MgO after extraction for 1 month with hot NaCl. The results are discussed with reference to the extraction of dusts by lung sera. J. W. S.

Granular forms of melilitic rocks. F. RONOLICO (Atti R. Accad. Lincei, 1936, [vi], 24, 471—476).—Analyses and crystallographic data are given for a melilitic rock from Pian di Celle near San Venanzo, Italy. The rock contains melilite, leucite, phlogopite, olivine, magnetite, and apatite.

O. J. W.

Metamorphic rocks at Torne Trask (Lapland). H. A. BROUWER (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 414—421).

O. D. S.

Leucite and pseudoleucite. N. L. BOWEN and R. B. ELLESTAD (Amer. Min., 1937, 22, 409—415).—Determinations on leucites of contrasted occurrence show that leucite never has a high Na content; it can contain 1 to 1.5% Na_2O replacing K_2O . For the development of pseudoleucite, reaction with liquid magma is essential. Chemical analyses of three leucitic rocks are given.

L. S. T.

Identity of penroseite and blockite. F. A. BANNISTER and M. H. HEX (Amer. Min., 1937, 22, 319—324).—X-Ray photographs show that penroseite from Colquechaca, Bolivia, and blockite from the Hiaco mine, Colquechaca, have the same symmetry and crystal structure; the Pb content is practically const., but the Ag content varies somewhat. The microchemical analyses given confirm these conclusions, and also show Se in excess of the formula $(\text{RAg}_2)\text{Se}_2$. The variation in Ag and Pb contents is partly due to admixture with naumannite, and the true composition of penroseite remains uncertain. Penroseite and blockite can be regarded as identical minerals, and the latter name should be discarded.

L. S. T.

Constitution and classification of the natural silicates. H. BERMAN (Amer. Min., 1937, 22, 342—408).—The theory of the constitution of the silicates, based on the Si-O tetrahedron and the combinations with neighbouring tetrahedra revealed by X-ray analyses of structure, is outlined and discussed. A classification of the silicates into structural types based on the various types of linking of these tetrahedra is tabulated. The types are: silica (1:2); disilicate (2:5); metasilicate, chains (3:8), (4:11), (1:3) and rings ($n:3n$); pyrosilicates (2:7); and orthosilicates (1:4), where the nos. in parentheses give the ratio of the no. of Si or Si-like atoms, including, in part, Al and Be, to the no. of O atoms or OH and F, which may replace O. The constitution of many minerals in each of these types is discussed.

L. S. T.

Crystallographic studies in the vivianite group. T. F. W. BARTH (Amer. Min., 1937, 22, 325—341).—X-Ray and reflexion goniometer measurements of this group are recorded. The vals. of a_0 , b_0 , c_0 , β , and d , respectively, are for vivianite (I) 10.039, 13.388, 4.687, $104^\circ 18'$, 2.711; bobierite (IV), 9.946, 27.654, 4.6395, $104^\circ 1'$, 2.169; erythrite (II) 10.184, 13.340, 4.730, $105^\circ 1'$, 3.182; and anna-

bergitte (III) 10.122, 13.284, 4.698, $104^{\circ} 45'$, 3.231. For (I), (II), and (III), the space-group is C_{2h}^2 . The names hautefeullite and cabrerite should be discarded in favour of (IV) and (III), respectively. Optical data are given for the minerals and for the artificial products of this group.

L. S. T.

Chemical composition of sepiolite (meerschau). W. T. SCHALLER (Amer. Min., 1936, 21, 202).—A crit. review of many chemical analyses shows that there is only one sepiolite, with the formula $2MgO \cdot 3SiO_2 \cdot 4H_2O$, and the name parasepiolite should be discarded.

L. S. T.

Anorthite from Duke Island, Alaska. J. J. GLASS (Amer. Min., 1936, 21, 201).—Unusually pure anorthite (An_{98}) occurs in a coarse-grained hornblende pegmatite.

L. S. T.

X-Ray study of allemontite. R. J. HOLMES (Amer. Min., 1936, 21, 202—203).—An X-ray study of specimens from Allemont, France, Pribram, Czechoslovakia, Atlin, B.C., and Alder Island, B.C., shows that "allemontite" (I) consists of two components, *A* and *B*, apparently identical in all the material investigated. *A* is native As or As containing in solid solution an amount of Sb insufficient to alter the X-ray pattern, and *B* is either a compound or a solid solution of Sb and As. The variable composition of (I) is due to the wide variation in the relative proportions of *A* and *B*. The name allemontite should be restricted to *B*.

L. S. T.

Crystallography of livingstonite. W. E. RICHMOND, jun. (Amer. Min., 1936, 21, 204).—Livingstonite from Huitzuco, Mexico, is monoclinic, holohedral, with $a:b:c$ 3.758:1:5.366, β $104^{\circ} 10'$ (goniometer), unit cell $Hg_4Sb_{16}S_{28}$ a_0 15.14, b_0 3.98, c_0 21.60 Å., $a_0:b_0:c_0 = 3.804:1:5.427$ (X-ray).

L. S. T.

Structure of stilpnomelane. J. W. GRÜNER (Amer. Min., 1936, 21, 204—205).—X-Ray photographs suggest a layer structure similar to chlorite and mica with a_0 5.4, b_0 9.3, c_0 24.1 Å., and a unit cell containing 2 mols. of

$(OH)_{20}K(Fe^{++}Mg)(Fe^{+++}Al)_{5-6}Si_{16}O_{39-40}$. The mineral is stable up to 560° , but its structure is destroyed at 740° .

L. S. T.

Crystal structure of cubanite. M. J. BUERGER (Amer. Min., 1936, 21, 205).—An equi-inclination Weissenberg study gives space-group $Pcmm = V_4^{16}$; a 6.45, b 11.07, c 6.21 Å., and 4 formula wt. per unit cell. A structure, based on a substituted wurtzite framework, is proposed. A unique feature of the structure is the occurrence of the Fe atoms in pairs; the vectors connecting the pairs have greatest components in the direction of the *b*-axis. This is probably responsible for the ferromagnetism of cubanite, the magnetic axis of which is the *b*-axis.

L. S. T.

Crystal structure of valentinite. M. J. BUERGER (Amer. Min., 1936, 21, 206—207).—An equi-inclination Weissenberg study of valentinite from the Su Suergiu mine, Sardinia, and of Sb_2O_3 sublimed in an atm. of N_2 , gives a 4.92, b 12.46, c 5.42 Å., d 5.75,

$4Sb_2O_3$ per cell; space-group $Pccn = V_4^{16}$. Positions and parameters of the Sb and O atoms are given.

L. S. T.

Crystallography of valentinite (Sb_2O_3) and andorite (?) ($2PbS \cdot Ag_2S \cdot 3Sb_2S_3$) from Oregon. W. T. SCHALLER (Amer. Min., 1937, 22, 651—666).—Valentinite has $a:b:c = 0.3939:1:0.4339$.

L. S. T.

Cathodo-luminescence spectra of feldspars and other alkali aluminosilicate minerals. S. IMORI and J. YOSHIMURA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 31, 281—295).—Spectra from four varieties of feldspar were compared with the spectra from jadeite, leucite, kunzite, lepidolite, Na_2CO_3 , and K_2CO_3 , and from Na and K burning in O_2 . Those from the minerals were characterised by three bands, viz., red (670—620 m μ), yellow (620—510 m μ), and blue-violet (500—370 m μ). No red band was obtained with Na_2CO_3 nor a blue-violet band with Na. A tentative explanation is offered for the existence in the characteristic bands for the minerals of discrete bands corresponding with bands due to Na and K.

C. R. H.

Types of pegmatites in the Archean at Grand Canyon, Arizona. I. CAMPBELL (Amer. Min., 1937, 22, 436—445).—Like granite, pegmatites may have formed initially in ways other than by simple intrusion. In this area three types of origin have been recognised: by magmatic intrusion; by replacement, "pegmatization," processes; and by hydrothermal feldspathisation of quartz veins.

L. S. T.

Occurrence of photosensitive yellow rock-salt in Hall Salzberg. O. SCHAUBERGER (Berg- u. hüttenmann. Jb. montan. Hochschule Leoben, 1935, 83, 115—117; Chem. Zentr., 1936, i, 3481).—The salt is decolorised in a few min. in daylight, but is stable in the dark up to 160 — 180° . The decolorisation is irreversible.

J. S. A.

Thortveitite and magnesium pyrophosphate. F. MACHATSCHKI (Fortschr. Min., 1936, 20, 47—49; Chem. Zentr., 1936, i, 3481).— $Mg_3P_2O_7$ is monoclinic, with a 13.28, b 8.36, c 9.06 Å., $\beta = 104^{\circ} 11'$. The *a* and *b* axes are doubled, and the hardness is much diminished, as compared with thortveitite, $Sc_2Si_2O_7$.

J. S. A.

Petrological notes. I—X. S. TSUBOI (Japan J. Geol., 1935, 12, 109—113).—Chemical and optical data are given for Japanese pyroxene, hornblende, anorthite, cummingtonite, and biotite from different sources.

CH. ABS. (e)

Metamorphic rocks of southern Abukuma plateau. K. SUGI (Japan J. Geol., 1935, 12, 115—151).

CH. ABS. (e)

Differences in behaviour of old and new gold ore gangues. H. BORCHERT (Fortschr. Min., 1936, 20, 33; Chem. Zentr., 1936, i, 3482).—Differences in the thermal conditions of gangue deposition are discussed.

J. S. A.

Soil and coal formation. I. D. SEDLETSKY (Problems Soviet Soil Sci. Symposium, 1936, 1, 125—134).—General discussion based on the X-ray structural relationships between humic acid and various kinds of coal.

A. M.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

SEPTEMBER, 1937.

Structure of H_2 of hydrogen. N. A. KENT, R. M. FRYE, and W. H. ROBINSON (Physical Rev., 1937, [ii], 51, 990; cf. A., 1927, 997).—Using two Lummer plates dispersing in the same plane, the microphotometer curves of the resultant pattern showed four distinct components of H_2 with intensities and positions approx. as given by theory. N. M. B.

Interferometer measurements of wave-lengths in H_2 bands. H. LANDAHL and G. S. MONK (Physical Rev., 1937, [ii], 51, 993).—Intensities and $\lambda\lambda$ accurate to 0.002–0.005 Å. for 56 lines in the range 6285–8546 Å. are tabulated. N. M. B.

Band systems ending on the $1s2s\sigma^1\Sigma_g$ (1X_g) state of H_2 . I. O. W. RICHARDSON (Proc. Roy. Soc., 1937, A, 160, 487–507).—An analysis of the band system. Rotational structures are tabulated. G. D. P.

Cessation of axiality of the hydrogen atom and the helium atom ion by the electric field and radiation collision. J. STARK (Physikal. Z., 1937, 38, 572–574).—An explanation of the effect of an electric field and of collisions on the emission spectrum of H and He, based on the theory of the axiality of the atom and electron, is given. A. J. M.

Nuclear spins and magnetic moments in the Hartree model. M. E. ROSE and H. A. BETHE (Physical Rev., 1937, [ii], 51, 993; cf. this vol., 163).—A correction. The ground states of ^{12}B , ^{11}B , and ^{11}C are 3P_0 , 2P_1 , and 2P_1 , respectively, and the magnetic moments of ^{11}B and ^{11}C are -0.52 and 1.57 , respectively. N. M. B.

Absorption spectrum of solid oxygen in the far red. A. PRICHOTKO (Physikal. Z. Sovietunion, 1937, 11, 465–477).—Crystals of O_2 of sufficient transparency for absorption experiments were obtained by slow cooling. Layers of the α -modification of 0.5–5 mm. thickness were examined, but owing to the low absorption of the γ -form large homogeneous crystals of the latter were necessary. The absorption spectra of the liquid and of the α - and γ -solid forms consisted of four intense bands. The spectra of the liquid and γ -form differ only in the sharpness of the edges. The absorption of the α -form differs in structure from that of the others. The absorption bands of solid O_2 are similar to those of the gas, and are due to the same transitions, but they possess a complicated structure characteristic of the crystal. A. J. M.

Internuclear distance in oxygen molecules. H. D. BABCOCK (Proc. Nat. Acad. Sci., 1937, 23,

301–304).—Twelve absorption bands of atm. O_2 have been measured, eight associated with $^{16}\text{O}^{16}\text{O}$, two with $^{16}\text{O}^{17}\text{O}$, and two with $^{16}\text{O}^{18}\text{O}$, and the 575 lines have been assigned. Internuclear distances for the various electronic and vibrational states of each type of O_2 are calc. $^{16}\text{O}^{18}\text{O}$ increases in size with change in electronic state and with increased vibrational energy in a particular electronic state.

W. R. A.

Action of ultra-violet sunlight on the upper atmosphere. M. N. SAHA (Proc. Roy. Soc., 1937, A, 160, 155–173).—Existing information concerning the action of sunlight ($\lambda < 3000$ Å.) on mol. O_2 and N_2 is summarised and it is shown that the ultra-violet radiation of the sun differs from that of a black body. The necessity for carrying out laboratory experiments on the absorption spectra of O_2 and N_2 is emphasised. G. D. P.

Spectrum of Na I with high resolution and the structure of the 2D terms. K. W. MEISSNER and K. F. LUFT (Ann. Physik, 1937, [v], 29, 698–712).—Light from a beam of Na atoms excited by electronic impact giving a spectrum of great intensity and sharpness was examined by the Fabry-Perot method. Members of the second subordinate series gave a vibration difference $\Delta\nu = 3^2P_1 - 3^2P_3 = 17.1963 \text{ cm}^{-1}$; two members of the first subordinate series were resolved into doublets. Separation of the 2D terms was determined. H. C. G.

Sodium spectrum. K. W. MEISSNER and E. EBBINGHAUS (Ann. Physik, 1937, [v], 29, 713–714).— $\lambda\lambda$ of lines in the subordinate series of the Na spectrum from a specially prepared Geissler tube were compared with those from the at. beam source. No λ shift was detected. H. C. G.

New absorption spectrum of diatomic sulphur. P. W. SCHENK (Z. Physik, 1937, 106, 271–272).—A criticism of Cordes (this vol., 271). L. G. G.

Magnetic nuclear moment of ^{39}K . K. W. MEISSNER and K. F. LUFT (Z. Physik, 1937, 106, 362–364).—From hyperfine structure ($\Delta 2S$, and $\Delta 2P_1$) of the K resonance lines 7665 and 7699 Å., $\mu = 0.40$ and 0.30 nuclear magnetons respectively. L. G. G.

Extinction of fluorescence of iodine vapour by magnetic fields. E. SCHOLZ (Z. Physik, 1937, 106, 230–235).—Apparatus is described for photography of the resonance series excited by 5462 Å. radiation in I vapour subjected to magnetic fields of 0–20,000 gauss. The validity of Van Vleck's law

($Q = fH$, where Q = extinction and H = field strength) is confirmed over the range of H employed.
L. G. G.

Bergmann series of caesium. K. W. MEISSNER and W. WEINMANN (Ann. Physik, 1937, [v], 29, 758—760).—The ground terms of the Bergmann series of Cs at 1μ have been examined with a Fabry-Perot etalon and their structure is determined. The line at 10,123.5 Å. is a doublet; $\Delta\nu = 0.177\text{ cm.}^{-1}$
H. C. G.

Arc spectrum of mercury in the infra-red. G. WIEDMANN and W. SCHMIDT (Z. Physik, 1937, 106, 273—278).—A new infra-red prism spectrograph is described, and lines have been measured from 7097 to 12,156 Å.
L. G. G.

Photo-electric measurement of the diurnal variations in daylight in temperate and tropical regions. W. R. G. ATKINS, N. G. BALL, and H. H. POOLE (Proc. Roy. Soc., 1937, A, 160, 526—539).—An investigation of the vertical and total illumination from sun and sky in England and in Ceylon.
G. D. P.

Physical processes in gaseous nebulae. I. Absorption and emission of radiation. D. H. MENZEL (Astrophys. J., 1937, 85, 330—339).—Various fundamental formulæ are derived. The total emission and absorption of radiation by at. H are evaluated, together with the no. of transitions to and from any quantum level. General equations that determine the statistical equilibrium of the assembly and the partition of atoms into various at. states are developed.
L. S. T.

Widths and shapes of X-ray lines reflected from flat powder layers. G. W. BRINDLEY (Proc. Leeds Phil. Soc., 1937, 3, 353—368; cf. A., 1935, 16).—The widths of X-ray reflexions from flat powder layers are calc. and discussed. A distinction can be drawn between the type of line obtained inside and outside a region of sharp focussing. An analysis of the distribution of intensity in the line recorded on a cylindrical film surrounding the powder is given.
N. M. B.

Effect of temperature on the reflexion of X-rays. M. BLACKMAN (Proc. Camb. Phil. Soc., 1937, 33, 380—384).—Theoretical. An exact expression for the temp. factor for a cubic crystal is determined, and its relation to the properties of the vibrational spectrum is investigated.
F. J. L.

Shape of the Compton lines. I. A. SOMMERFELD. II. W. FRANZ (Ann. Physik, 1937, [v], 29, 715—720, 721—740).—I. Theoretical (cf. A., 1936, 1041).

II. The discontinuity of the Compton band on the short-wave side is discussed mathematically for a series of atoms. It is concluded that the Raman lines beyond the limit of the Compton band could probably not be observed, but that the existence of the discontinuity itself might be established by direct observation in spite of the overlapping of the primary line and the presence of the continuous underground, through careful selection of the angle of observation.
H. C. G.

Lattice constant of quartz and measurement of the $K\alpha$ wave-length of 45Rh, 46Pd, and 47Ag.

S. ELG (Z. Physik, 1937, 106, 315—321).—The lattice const. of quartz (0001 plane) using Mo $K\alpha_1$ radiation is 1797.872. Vals. are recorded for λ ($K\alpha$ radiation) of Rh, Pd, and Ag and n for quartz is calc.
L. G. G.

(A) **Spectra of K III, Ca IV, and Sc V, and their relation to the spectra of other ions in the isoelectronic sequence Cl I to Mn IX.** P. G. KRUGER and L. W. PHILLIPS. (B) **Spectra of Sc IV, Ti V, Mn VIII, and Fe IX in the isoelectronic sequence Ar I to Fe IX.** P. G. KRUGER, S. G. WEISSBERG, and L. W. PHILLIPS (Physical Rev., 1937, [ii], 51, 1087—1089, 1090—1091; cf. A., 1935, 1437).—(A) From spectrograms of Sc and Ca taken with a 21-ft. vac. spectrograph, multiplets are identified and classified.

(B) Data in the sequence Ar I—Fe IX are completed. Radiation connecting the higher terms with the ground state in all the ions has been identified.
N. M. B.

Geiger-Müller counter measurements of reflected Mo $K\alpha$ X-rays from powdered zinc. R. D. MILLER (Physical Rev., 1937, [ii], 51, 959—963).—The formula due to Volz (Z. Physik, 1935, 93, 540) for counting rate is verified. F vals. for various reflexions were measured and results are in agreement with those of Brindley (cf. A., 1936, 3) corr. for dispersion.
N. M. B.

$L\alpha$ lines of some nickel alloys. F. C. CHALKLIN and S. P. HILLSON (Phil. Mag., 1937, [vii], 24, 190—195).—Measurements on four Ni alloys show no λ shift due to alloying of the metal, indicating no change in the $M_{IV,V}$ level of the atom. Approx. measurements on two Cu alloys show no evidence of shift of the $L\alpha$ line.
A. J. E. W.

Radiation probabilities, Auger effect, and energy level widths for Au (79). E. G. RAMBERG and F. K. RICHTMYER (Physical Rev., 1937, [ii], 51, 913—925; cf. A., 1935, 138).—Full tabular data for energy level widths, calc. on the Weisskopf-Wigner theory, and non-relativistic corrections for radiation transitions and Auger effects are given.
N. M. B.

Satellite structure of $L\alpha$ and $L\beta_3$ of Au(79). F. K. RICHTMYER and E. G. RAMBERG (Physical Rev., 1937, [ii], 51, 925—929; cf. preceding abstract).—On the basis of the Coster-Kronig hypothesis of satellite origin, separations and relative intensities are calc. by the theory of complex spectra. Using data on the mean life of the states involved in the transitions and on the probability of the Auger effect producing the initial state for the satellite emission, contours of the satellite structure agree satisfactorily with experimental patterns and confirm the Coster-Kronig theory.
N. M. B.

Thermionic approximations to the gas-covered fraction of an adsorbing surface, applied to the temperature dependence of oxygenation and oxidation of a tungsten filament. M. C. JOHNSON and F. A. VICK (Proc. Physical Soc., 1937, 49, 409—418).—Theoretical. A set of thermionic currents from W, measured in presence of small and approx. const. traces of O_2 , can be analysed in two ways to obtain information on the fraction of the

surface covered. A new method of obtaining work functions of a partly oxygenated surface has been devised. C. R. H.

Thermionic emission into dielectric liquids. E. B. BAKER and H. A. BOLTZ (Physical Rev., 1937, [ii], 51, 989).—A crit. discussion of the results of Reiss (cf. this vol., 337), and a comparison of the "potential dissociation effect" and thermionic emission theories. N. M. B.

Field emission from film-covered cathodes. Aluminium-aluminium oxide-cæsium oxide. H. MAHL (Naturwiss., 1937, 25, 459; cf. Malter, Physical Rev., 1936, [ii], 50, 48).—The anomalous electron emission from an oxidised Al cathode coated with Cs_2O has been photographed by means of an electron microscope, and is described. O. D. S.

Thin film field emission. E. R. PIORE (Physical Rev., 1937, [ii], 51, 1111—1112).—Measurements and curves for $\text{BaO-B}_2\text{O}_3$ films evaporated on a metal plate and treated with Cs and O_2 show the existence of anomalous secondary electron emission similar to that reported by Malter (cf. *ibid.*, 1936, 50, 48) for Al_2O_3 . N. M. B.

Secondary-electron emission from complex surfaces. L. R. G. TRELOAR (Proc. Physical Soc., 1937, 49, 392—408).—Data for secondary emission from W and Mo on which Ba or Th has been deposited indicate that for a given base metal, and provided the thickness of the deposit is <1 at. layer, the log of the secondary emission coeff. varies linearly with the work function, in agreement with the author's theory. From data obtained with thicker deposits it is calc. that the average depth at which secondary electrons originate is 1.4 at. layer. C. R. H.

Excitation of the C state of hydrogen by electron impact. R. ROSCOE (Proc. Leeds Phil. Soc., 1937, 3, 369—372).—An investigation of the energy losses undergone by electrons in inelastic collision with H_2 mols., for electron energies 30—130 volts, confirms the results of Jones (cf. A., 1929, 115). The calc. and experimental relative probabilities of transitions to the vibrational levels of the C state show max. corresponding with energy losses of 12.87 and 12.53 volts, respectively, giving an unexplained divergence of 0.34 volt. N. M. B.

Variation of the primary specific ionisation of hydrogen as a function of incident electron energy. M. G. E. COSYNS (Bull. Acad. roy. Belg., 1937, [v], 23, 498—513).—In order to verify available calc. results on the interaction of H atoms and electrons of 10^6 e.v. (min. ionisation) to high energies, the primary sp. ionisation was measured by a Geiger-Müller counter method. For lower energy radiation the hard β -rays of U- X_2 , and for high energies cosmic radiation, were used. Results contrary to theory are obtained, the ionisation decreasing continuously for higher energies. N. M. B.

Automatic plotting of electron trajectories. D. B. LANGMUIR (Nature, 1937, 139, 1066—1067).—An apparatus for this purpose is described. L. S. T.

Behaviour of electrons in bromine. J. E. BAILEY, R. E. B. MAKINSON, and J. M. SOMERVILLE

(Phil. Mag., 1937, [vii], 24, 177—190).—The diffusion of photo-electrons in Br vapour has been studied by a method previously applied to Cl_2 (A., 1935, 677). Certain kinetic properties of the electrons are deduced. A. J. E. W.

Production of positive and negative electron pairs in a cloud chamber. L. SIMONS and K. ZUBER (Proc. Roy. Soc., 1937, A, 159, 383—394).—Positron and electron pairs produced in A and in MeI vapour by γ -rays have energies of 2.62×10^6 e.v. In A the average energy of positrons is about equal to that of electrons, but in MeI there is a difference. The distribution in direction of ejection, relative to the incident γ -ray, agrees with theory. A new instrument for measuring the curvature of tracks in gases of high at. no. is described. G. D. P.

Recombination of ions over an extended pressure range. L. B. LOEB (Physical Rev., 1937, [ii], 51, 1110—1111).—Theoretical. A reconciliation of the Thomson and Langevin theories is discussed. N. M. B.

Low-voltage proton sources. E. S. LAMAR, W. W. BUECHNER, and K. T. COMPTON (Physical Rev., 1937, [ii], 51, 936—941; cf. A., 1934, 1052; 1935, 1185; 1936, 130).—Attempts to increase the proton yield from capillary arc sources are described. A quartz capillary showed evidence of gradual disintegration by low-speed electrons in the discharge. A Pyrex capillary source gave proton yields up to 20%. The introduction of H_2O vapour into the tube in an attempt to increase the at. H present gave a fourfold % increase in proton yield. The source has greater ion current efficiency, requires no cooling, is easily constructed, and is free from impurities. N. M. B.

At. wt. and its importance for the characteristics of chemical elements. S. A. SCHUKAREV (Trav. Congr. Jubil. Mendeléev, 1937, 2, 363—370).—The significance of the mass term which occurs in most mathematical expressions dealing with physical properties is discussed. C. R. H.

Radioactive isotope of rubidium. A. HEMMENDINGER and W. R. SMYTHE (Physical Rev., 1937, [ii], 51, 1052—1053; cf. Hahn, this vol., 210).—The isotopes of Rb have been separated by means of a high-intensity mass spectrometer. Measurements of radioactivity of samples collected at masses 84, 86, 87, 88, and 90 show that ^{87}Rb is radioactive and no other isotope shows appreciable activity. N. M. B.

Modern methods of predicting elements. (FRAU) I. NODDACK (Trav. Congr. Jubil. Mendeleev, 1937, 2, 371—377).—A brief account of the methods used in discovering some of the newer elements. C. R. H.

Present state of Mendeléev's periodic law. S. A. SCHUKAREV (Trav. Congr. Jubil. Mendeléev, 1937, 2, 37—49).—A lecture. The law is discussed in the light of modern knowledge of the electronic structure of the elements. C. R. H.

Development of the periodic system. W. NODDACK (Trav. Congr. Jubil. Mendeléev, 1937, 2, 53—59).—A lecture. C. R. H.

Scattering of alpha-particles in helium, hydrogen, and deuterium. C. B. O. MOHR and G. E. PRINGLE (Proc. Roy. Soc., 1937, A, 160, 190—206).—The experiments show that the Coulomb law of force fails at distances exceeding 10^{-12} cm. The ratio of observed to "classical" scattering is large for H_2 and D_2 , but for He is < previous estimates. Nuclear potentials are discussed and a calculation of wave functions for motion in a Coulomb field is given.

G. D. P.

Continuous β -ray spectrum. F. L. ARNOT (Nature, 1937, 139, 1065).—Theoretical. This spectrum can be explained without assuming the existence of undetectable neutrinos.

L. S. T.

Nuclear β -rays of radium-D. H. O. W. RICHARDSON and A. LEIGH-SMITH (Proc. Roy. Soc., 1937, A, 160, 454—463).—Study of 107 β -ray tracks of Ra-D produced in a cloud chamber shows that $57 \pm 8\%$ of the electrons have energies < 4 kv., and that < 3% have energies exceeding 13 kv. No evidence for the presence of a long-range β -transition between the ground states of Ra-D and -E is found.

G. D. P.

Law of Sargent. G. E. UHLENBECK and H. KUIPER (Physica, 1937, 4, 601—605).—Mathematical. The dependence of the decay const. of β -radioactivity on the max. energy and on the nuclear charge has been calc. The ratio of electron to positron emission in the branch reaction of ^{64}Cu is calc. to be 7.2 (cf. van Voorhis, this vol., 59).

O. D. S.

Comparison of the γ -ray intensities from radium preparations. J. A. C. TEEGAN (Sci. Proc. Roy. Dublin Soc., 1937, 21, 449—452).—A steady deflexion, or null, method of high accuracy, eliminating the disadvantages of the electroscope method, is described. The ionisation produced by the γ -rays emitted from Ra needles placed outside a special ionisation chamber is amplified by means of an electrometer valve unit.

N. M. B.

Hard γ -rays from Ra-C + C' + C'' + D. S. NISHIDA (Physical Rev., 1937, [ii], 51, 996; cf. Devons, this vol., 210).—Examination with a Wilson chamber showed rays of approx. energies 3.1, 4, and 4.9 m.e.v., indicating that hard γ -rays, but not such β -rays as abnormal decay electrons, are emitted. An explanatory scheme of levels is suggested.

N. M. B.

Coherent scattering of γ -rays at nuclei. A. ACHESER and I. POMERANTSCHUK (Physikal. Z. Sovietunion, 1937, 11, 478—497).—Theoretical. Formulae are derived for the effective cross-section of the scattering.

A. J. M.

Neutron scattering by magnetic substances. O. HALPERN and M. H. JOHNSON, jun. (Physical Rev., 1937, [iii], 51, 992).—Using the theory of Bloch (cf. A., 1936, 1173), results of a complete quantum mechanical treatment are given for unmagnetised paramagnetic and for ferromagnetic bodies. Expressions for magnetic cross-section are compared.

N. M. B.

Magnetic scattering of neutrons. II. F. BLOCH (Physical Rev., 1937, [ii], 51, 994; cf. A., 1936, 1173).—The comparative results of treating the

neutron as a true magnetic dipole, a sphere, or a cylinder are examined.

N. M. B.

Scattering of fast neutrons. C. H. FAX (Physical Rev., 1937, [ii], 51, 995).—Using Bethe's larger nuclear radius, the elastic cross-sections of heavy nuclei for Be-Rn neutrons are recalcd. and plotted, and results are compared with previous vals. (cf. A., 1936, 1314).

N. M. B.

Neutron yields from artificial sources. E. AMALDI, L. R. HAFSTAD, and M. A. TUVE (Physical Rev., 1937, [ii], 51, 896—912).—Using the technique of reduction to thermal energies (cf. this vol., 58), measurements of the total yields of neutrons from deuteron bombardment of D_2O , Li, Be, and C for the range 300—1000 kv., and from Rn + Be were made. Graphs for the "activability" of the detector relative to the source-target distance are given and abs. yields approx. to 20% are calc.

N. M. B.

Atomic transformation by means of γ -rays. W. BOTHE and W. GENTNER (Z. Physik, 1937, 106, 236—248).—A continuation of previous work (this vol., 212).

L. G. G.

Elementary consideration of some nuclear phenomena. A. H. CROUP and L. A. GOLDBLATT (J. Chem. Educ., 1937, 14, 210—215).—A non-mathematical review of the nuclear transformations and artificial radioactivity of the lighter elements.

L. S. T.

Conservation of energy in the disintegration of ^8Li . L. H. RUMBAUGH, R. B. ROBERTS, and L. R. HAFSTAD (Physical Rev., 1937, [ii], 51, 1106—1107; cf. this vol., 5).—Detailed deductions from an investigation of the reaction $^7\text{Li} + ^2\text{D} = ^8\text{Li} + ^1\text{H} + Q$ are reported, and excitation curves for the delayed α - and β -particles, and an energy diagram for ^8Li disintegration, are given. Considerations of conservation of energy and electric charge require the application of the neutrino hypothesis giving $^8\text{Li} \rightarrow ^4\text{He} + ^4\text{He} + {}_{-1}e + \nu + Q_2$.

N. M. B.

Radioactive α -particles from $^7\text{Li} + ^2\text{H}$. W. A. FOWLER and C. C. LAURITSEN (Physical Rev., 1937, [ii], 51, 1103).— α -Particle radioactivity when Li is bombarded by deuterons has been found by cloud-chamber investigation. A range-distribution curve is given and discussed. The suggested reactions and energy relation are: $^7\text{Li} + ^2\text{H} \rightarrow ^8\text{Li} + ^1\text{H} + Q$; $^8\text{Li} \rightarrow ^8\text{Be} + e^- + E_0$; $^8\text{Be} \rightarrow ^4\text{He} + ^4\text{He} + T$; $Q + E_0 + T = 15.6 \pm 0.2$ m.e.v. (cf. Lewis, this vol., 108).

N. M. B.

Proton-induced radioactivity in oxygen. L. A. DU BRIDGE, S. W. BARNES, and J. H. BUCK (Physical Rev., 1937, [ii], 51, 995; cf. this vol., 340).—Targets of quartz, solid oxides, or Pt foil in O_2 under bombardment by protons of energy 1.4—3.8 m.e.v. give rise to periods of 1.28 ± 0.10 and 107 ± 4 min. The former is identified with ^{17}F formed by the capture of a proton by ^{16}O , and the latter to the reaction $^{16}\text{O} + ^{18}\text{F} \rightarrow ^{17}\text{F} + n$; $^{18}\text{F} \rightarrow ^{18}\text{O} + e^+$. The reaction sets in sharply at 2.6 and rises rapidly to 3.8 m.e.v.; the approx. cross-section is 4×10^{-25} sq. cm.

N. M. B.

Separation of unweighably small amounts of artificially radioactive phosphorus from the

stable isotope. O. ERBACHER and K. PHILIPP (Z. physikal. Chem., 1937, **179**, 263—274; cf. A., 1936, 773).— Ph_3PO_4 in C_6H_6 solution is bombarded with neutrons, and the ^{32}P produced, which is in the ionised form, extracted with H_2O or C . The amount of ordinary stable P in the extract is $< 1.2 \times 10^{17}$ th part of the amount bombarded. R. C.

Induced radioactivity of potassium. D. G. HURST and H. WALKE (Physical Rev., 1937, [ii], **51**, 1033—1037; cf. this vol., 213).—In addition to formation by deuteron or slow neutron bombardment of K salts, ^{42}K is formed by the reactions $^{45}\text{Sc} + ^1_0\text{n} \rightarrow ^{42}\text{K} + ^4_2\text{He}$ and $^{42}\text{Ca} + ^1_0\text{n} \rightarrow ^{42}\text{K} + ^1_1\text{H}$, the relative probability in the last case being small. The half-life is 12.4 ± 0.2 hr. Fast neutron irradiation of K yields active Cl and ^{41}A thus: $^{39}\text{or } ^{41}\text{K} + ^1_0\text{n} \rightarrow ^{36}\text{or } ^{38}\text{Cl} + ^4_2\text{He}$; $^{41}\text{K} + ^1_0\text{n} \rightarrow ^{41}\text{A} + ^1_1\text{H}$. α -Particle bombardment of Cl yields ^{38}K (half-life 7.7 ± 0.1 min.) thus: $^{35}\text{Cl} + ^4_2\text{He} \rightarrow ^{38}\text{K} + ^1_0\text{n}$, and deuteron bombardment of Ca gives: $^{40}\text{Ca} + ^2_1\text{H} \rightarrow ^{38}\text{K} + ^4_2\text{He}$. N. M. B.

Radioactivity of ^{38}K . W. J. HENDERSON, L. N. RIDENOUR, M. G. WHITE, and M. C. HENDERSON (Physical Rev., 1937, [ii], **51**, 1107).—Rock-salt and also NiCl_2 , but not Na_2CO_3 , bombarded with 0.05 microamp. of 7 m.e.v. α -particles give a strong activity of 7.5 ± 0.1 min. half-life. The emitted particles are positrons, and evidence indicates that the radioelement is ^{38}K formed from ^{35}Cl . Hence Walke's ^{38}K (10.5 hr.) (cf. this vol., 213) is probably ^{42}K (12.2 hr.). N. M. B.

Radioactivity produced in nickel by deuteron bombardment. R. L. THORNTON (Physical Rev., 1937, [ii], **51**, 893—896).—Ni bombarded with 5-mv. deuterons exhibits an intense positron activity of half-life 3.4 ± 0.1 hr., shown chemically to be isotopic with Cu. The energy excitation curve for 3—5 mv. for this reaction (proton capture) differs markedly from that for Cu (neutron capture). The variation with energy of the disintegration cross-section agrees with theoretical formulæ for the penetration of a deuteron into a nucleus of radius 4.5×10^{-13} cm. N. M. B.

Artificial radioactivity produced by α -particles. L. N. RIDENOUR and W. J. HENDERSON (Physical Rev., 1937, [ii], **51**, 1102).—Co, Cu, and Ni become strongly radioactive when bombarded with about 0.05 microamp. of 7-m.e.v. α -particles. The relative initial intensities of the activities are Co : Cu : Ni = 100 : 15 : 22. In each case decay is accompanied by emission of positrons. The respective half-lives and suggested identifications are: 9.65 ± 0.07 min., 59 ± 1 min., 3.25 ± 0.05 hr., and ^{62}Cu , ^{68}Ga , ^{61}Cu . N. M. B.

Artificial radioactivity produced by fast neutrons and their inelastic collisions. J. ROTBLAT (Nature, 1937, **139**, 1110—1111).—The formation of a radio-element of 11 min. half-period from Cu irradiated by fast neutrons from a Be + Rn source has been confirmed (cf. this vol., 5). The product is ^{62}Cu derived from ^{63}Cu by the loss of a neutron. The 60 min. half-period product from Zn is also confirmed, but it is an isotope of Ni and not of Zn (cf. *loc. cit.*). In Ag, a product of 25 ± 3 min. half-period but not of 50 sec. activity (cf. *ibid.*, 107) has been

obtained, probably from the reaction $^{107}\text{Ag} + ^1_0\text{n} = ^{106}\text{Ag} + ^2_1\text{n}$. The efficiency of this reaction is approx. 0.03 of the total efficiency of fast neutrons in producing radioactivity in Ag. Activations of this type lead to the appearance of two neutrons that are more efficient than fast neutrons in producing activation of the "capture" type. This may account for the increase of artificial activity observed when fast neutrons pass through relatively small thicknesses of certain absorbing substances, and attributed hitherto to inelastic collisions. L. S. T.

Radioactive isotopes of copper. E. A. OESER and J. L. TUCK (Nature, 1937, **139**, 1110).—Irradiation of CuO with fast neutrons from a Ra-Be source gives a radioelement of 160 ± 10 min. half-period. This ppt. with NiS and must be due to ^{63}Ni or ^{65}Ni ; it may be produced from either ^{63}Cu or ^{65}Cu by capture of a neutron and expulsion of a proton. The same half-period has been found in Ni irradiated by slow neutrons. Cu irradiated by slow in the absence of fast neutrons shows an activity of 13 ± 0.5 hr. half-period, and the same activity was obtained by separating radioactive Cu from Zn bombarded by fast neutrons. No indication of a 6, 10, or 17 hr. period was obtained. L. S. T.

Production of a silver isotope of 24 minutes half-period by beryllium neutrons. H. REDDEMANN and F. STRASSMANN (Naturwiss., 1937, **25**, 458—459).—The 24 min. half-period activity produced in AgNO_3 by neutrons from a Ra-Be source remains in the ppt. after pptn. as AgCl . It is probably due to the process $^{107}\text{Ag} (n; 2n) ^{106}\text{Ag} \rightarrow 24$ min. as suggested by Bothe and Gentner (this vol., 162) and Heyn (*ibid.*, 340). O. D. S.

Long-period activity in cadmium irradiated with neutrons. A. C. G. MITCHELL (Physical Rev., 1937, [ii], **51**, 995—996).—Cd foil under neutron bombardment for a week gave rise to a decay curve showing periods 52 ± 5 and 5 hr. (cf. Cork, this vol., 277). The activity was too weak to allow identification. N. M. B.

Sidereal time periodicity of cosmic rays and its phase shift. J. BARNÓTHY and M. FORRÓ (Nature, 1937, **139**, 1064—1065). L. S. T.

Mechanism of the production of cosmic showers. P. AUGER, P. EHRENFEST, jun., A. FREON, and (MME.) T. GRIVET (Compt. rend., 1937, **204**, 1797—1799).—The production of secondary cosmic particles in Pb screens of varying thicknesses has been investigated. The results are in accord with the theory of Bhabha and Heitler (this vol., 213). A. J. E. W.

Absolute intensity of the ionisation in argon by cosmic radiation at sea level. J. CLAY and K. OOSTHUIZEN (Physica, 1937, **4**, 527—530; cf. Clay and Jongen, this vol., 213).—The ionisation has been determined in A at pressures from 38 to 1 atm. The intensities of ionisation at 1 atm. under 12 cm. and under 56 cm. of Fe are 1.58I and 1.46I, respectively. The max. energies of electrons ejected from the Fe walls under 56 cm. of Fe are $<$ under 12 cm. of Fe. O. D. S.

Decrease of hard primary cosmic rays in matter. J. CLAY, J. T. WIERSMA, and E. M. BRUINS (*Physica*, 1937, 4, 521—526; cf. A., 1936, 773).—The decrease has been determined in Hg, Pb, Fe, Sn, S, and H₂O under layers up to 1300 g. per sq. cm., and is shown to depend on mass and not on electron density or the size of the nucleus. The coeff. of decrease decreases with increasing thickness of the layers. It is suggested that the decrease is due partly to replacement of protons by neutrons and partly to energy loss in ionisation, showers, and radiation.

O. D. S.

Passage of fast electrons and theory of cosmic showers. H. J. BHABHA and W. HEITLER (*Proc. Roy. Soc.*, 1937, A, 159, 432—458).—A theoretical investigation of the production of secondary positive and negative electrons by a fast primary electron. Showers are explained by the ordinary quantum theory. Comparison with experiment shows that Rossi's transition curve and Regener's absorption curve are in agreement with theoretical predictions.

G. D. P.

Measurements of the nuclear absorption of electrons by the atmosphere up to about 10^{10} electron volts. I. S. BOWEN, R. A. MILLIKAN, and H. V. NEHER (*Nature*, 1937, 140, 23).—Cosmic ray intensities at different atm. heights at Madras, India, and San Antonio, Texas, indicate that these rays produce their max. ionisation before they have penetrated through the first tenth of the atm. The latitude-sensitive part of the cosmic ray ionisation found in the lower atm. is practically all due to the secondary effects of varied nature resulting from the incoming electrons in the upper tenth of the atm. The absorption coeffs. suggest that the particles producing the latitude and the east-west effect are predominantly positive electrons and not protons.

L. S. T.

Longitude effect and the asymmetry of cosmic radiation. G. LEMAÎTRE (*Nature*, 1937, 140, 23—24).

L. S. T.

Energy loss of cosmic ray particles in metal plates. P. M. S. BLACKETT and J. G. WILSON (*Proc. Roy. Soc.*, 1937, A, 160, 304—323).—The energy loss associated with the passage of cosmic ray particles through screens of Pb 1 cm. and 0.33 cm. and of Al 1 cm. thick has been measured. For energies of $< 2 \times 10^8$ e.v. the observed energy losses agree with the predictions of theory, but at higher energies a discrepancy appears. The necessary modifications of the radiation formula are discussed and a formula is derived fitting experimental facts as well as can be expected.

G. D. P.

Disintegration of high-energy protons. G. NORDHEIM, L. W. NORDHEIM, J. R. OPPENHEIMER, and R. SERBER (*Physical Rev.*, 1937, [ii], 51, 1037—1045).—Mathematical. Application of the Fermi theory of β -decay to energy transfers by high-energy protons to electrons and neutrinos in passing through matter is examined.

N. M. B.

Transformation series from neutron irradiation of uranium. L. MEITNER, O. HAHN, and F. STRASSMANN (*Z. Physik*, 1937, 106, 249—270).—A physical discussion of the relationship between the

three transformation series, and elements of at. no. 93 to 96.

L. G. G.

Determination of the number of free electrons in metals from their mean free paths. L. RIEDEL (*Metallwirts.*, 1937, 16, 634—640).—Recent investigations are reviewed.

C. E. H.

Heavy particle interactions from β -decay theory. G. D. CAMP (*Physical Rev.*, 1937, [ii], 51, 1046—1048).—Mathematical. Heavy particle and β -decay interactions could not be reconciled by replacing the small const. g of a Fermi type coupling by a function of the momenta of the light particles.

N. M. B.

Matrix element in Fermi's theory of β -decay. L. W. NORDHEIM and F. L. YOST (*Physical Rev.*, 1937, [ii], 51, 942—947).—Mathematical. The formulation of Fermi's theory of β -decay for a complex nucleus containing many particles is investigated.

N. M. B.

(A) **Mutual potential energy between two deuterons.** K. UMEMA, S. TOMONAGA, and Y. ONO. (B) **Exchange integral.** S. TOMONAGA and K. UMEMA (*Sci. Papers Inst. Phys. Chem. Res. Tokyo*, 1937, 32, 87—96, 97—102).—(A) Mathematical. The exchange energy is calc. on the basis of neutron-proton force.

(B) The conditions of disappearance of the exchange integral are determined.

F. J. L.

[Suggested] **experimental test of the proton-neutron exchange interaction.** H. J. BHABHA (*Nature*, 1937, 139, 1021—1022).

L. S. T.

Statistical calculation of the density of the energy levels of the nuclei. C. VAN LIER and G. E. UHLENBECK (*Physica*, 1937, 4, 531—542).—The calculation of Bethe (cf. A., 1936, 1175) is extended.

O. D. S.

Statistical theory of the nucleus. L. LANDAU (*Physikal. Z. Sovietunion*, 1937, 11, 556—565).—Formulae for the energy distribution of nuclear levels can be obtained without assuming the nucleus to be an ideal gas (cf. A., 1936, 1175). A formula for the determination of the width of resonance levels for neutrons is given. The inelastic scattering of neutrons is also discussed.

A. J. M.

Dynamic liquid model of atomic nuclei. K. UMEMA and Y. ONO (*Sci. Papers Inst. Phys. Chem. Res. Tokyo*, 1937, 32, 120—128).—Theoretical. The Thomas-Fermi liquid model of at. nuclei is treated dynamically by the method of Bloch (A., 1933, 443).

F. J. L.

Structure of nuclei beyond oxygen. E. WIGNER (*Physical Rev.*, 1937, [ii], 51, 947—958; cf. this vol., 109).—Mathematical. An attempt is made to correlate the inflexions in the mass defect curve with the energy differences between isobars as obtained by direct measurements and from the shift of the isotopic no. to higher vals. with increasing no. of particles.

N. M. B.

Magnetic moments of atomic nuclei. T. SCHMIDT (*Z. Physik*, 1937, 106, 358—361).—A regular relationship exists between nuclear magnetic and mechanical moments.

H. C. G.

Signs of the nuclear magnetic moments of ${}^7\text{Li}$, ${}^{85}\text{Rb}$, ${}^{87}\text{Rb}$, and ${}^{133}\text{Cs}$. S. MILLMAN and J. R. ZACHARIAS (Physical Rev., 1937, [ii], 51, 1049—1052).—Application of the at. beam method of non-adiabatic transitions shows that the sign is in each case positive, in agreement with results from hyperfine structure determinations. N. M. B.

Magnetic moment of the neutron. P. N. POWERS, H. CARROLL, and J. R. DUNNING (Physical Rev., 1937, [ii], 51, 1112—1113).—Investigations previously reported (cf. this vol., 211) on the transmission of neutrons through Fe plates are repeated with two and three plates, using neutrons emitted from a "howitzer" cooled to liquid air temp. Curves are given showing that the effect (% increase in transmission with the plates magnetised) increases for slower neutrons and for greater thicknesses of Fe. Theory is discussed. N. M. B.

Sign of the magnetic moment of free neutrons. O. R. FRISCH, H. VON HALBAN, jun., and J. KOCH (Nature, 1937, 139, 1021).—Using the method previously proposed (this vol., 340), the magnetic moment of the free neutron is found to be negative, *i.e.*, the relative direction of spin and magnetic moment is the same as in the electron. This is in agreement with expectations based on the magnetic moments of the proton and deuteron. L. S. T.

Origin of quadrupolar moments of atomic nuclei. J. SOLOMON (Compt. rend., 1937, 204, 1935—1938).—Mathematical. J. G. A. G.

Additional interaction of protons with an electromagnetic field, due to the presence of the electron-neutrino field. H. PRIMAKOFF (Physical Rev., 1937, [ii], 51, 990—991; cf. this vol., 278).—Mathematical. N. M. B.

Generalisation of the equations of the self-consistent field for two-electron configurations. A. F. STEVENSON (Proc. Roy. Soc., 1937, A, 160, 588—604).—Mathematical.

Calculation of transition probabilities in helium. E. A. HYLLERAAS (Z. Physik, 1937, 106, 395—404).—Theoretical. H. C. G.

Neutrino theory of light. A. SOKOLOV (Nature, 1937, 139, 1071).—Theoretical. L. S. T.

Bose amplitudes in the neutrino theory of light. V. FOCK (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 241—244).—Mathematical. A. J. E. W.

Values of fundamental atomic constants. S. VON FRIESEN (Proc. Roy. Soc., 1937, A, 160, 424—440).—A crit. survey of the at. consts. from a no. of sources leads to the following vals.: velocity of light $(2.9978 \pm 0.0002) \times 10^{10}$ cm. per sec., sp. charge of electron $(1.7585 \pm 0.002) \times 10^7$ e.m.u. per g., electronic charge $(4.800 \pm 0.005) \times 10^{-10}$ e.s.u., Planck's const. $(6.610 \pm 0.015) \times 10^{-27}$ erg sec., Avogadro's no. $(6.028 \pm 0.008) \times 10^{23}$, mass of H atom $(1.673 \pm 0.003) \times 10^{-24}$. The reciprocal of Sommerfeld's fine structure const. is thus 136.9, which agrees within the limits of error with Eddington's hypothetical val. 137. G. D. P.

Redetermination of the elementary charge by the oil drop method. Y. ISHIDA, I. FUKUSHIMA, and T. SUETSUGU (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 57—77, and Nature, 1937, 140, 29).—In view of discordant available vals. of e an investigation was made, using an improved Millikan apparatus, with special reference to the effect of the convection current on the speed of the oil drop, evaporation and oxidation (or adsorption) of the drop, the shape of the drop, and the effect of the arc on the drop. Full data are tabulated. The val. obtained for e is $(4.806 \pm 0.003) \times 10^{-10}$ e.s.u. using Harrington's val. for η . N. M. B.

Collision of two oil drops and the stability of a non-spherical oil drop. Y. ISHIDA (Nature, 1937, 140, 70—71).—In experiments on the fall of electrified oil drops for the determination of e (cf. preceding abstract) four types of drops, varying in shape and time of fall, have been identified. L. S. T.

Mechanism of the formation of atomic and colloidal centres of silver in alkali halide phosphors. A. TOPOREC (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 245—248; cf. A., 1936, 427).—The formation of at. Ag and K centres by penetration of electrons into KCl and KBr crystals has been studied by observing their ultra-violet absorption coeffs. The formation of colloidal Ag particles instead of at. centres is discussed. A. J. E. W.

Aluminium oxide bands. (Miss) E. BODSON and (Miss) F. DEHALU (Bull. Acad. roy. Belg., 1937, [v], 23, 408—415).—Using the method of explosion of fine Al wires as a source of excitation, several new bands of the system ${}^2\Sigma - {}^2\Sigma$ of AlO have been observed, and the sequences $\Delta v = 2$ and $\Delta v = 3$ have been traced beyond their convergence. The extrapolated normal heat of dissociation is 4.105 e.v. N. M. B.

Analysis of molecular ${}^3\Pi$ states with application to AlH, OH⁺, and BH. C. N. CHALLACOMBE and G. M. ALMY (Physical Rev., 1937, [ii], 51, 930—936).—The mol. consts. λ , B , and D are calc. by Gilbert's method (cf. A., 1936, 661) with a more accurate consideration of the rotational D terms. A graphical method of obtaining λ is developed. Graphs show, for $K = 2, 3, 4, 5$, the variation in multiplet splitting as the coupling const. λ varies from -8 to 10 . New data for AlH lines with $K < 6$ are given. A comparison of corresponding electronic ls coupling coeffs. in mol. and atom is made. N. M. B.

Structure of the α and β band systems of SiF. E. H. EYSTER (Physical Rev., 1937, [ii], 51, 1078—1086).—A new vibrational analysis of the α system is given, and a detailed rotational structure analysis of the (0, 0) band of the α and of the β system is tabulated. Consts. are evaluated and spin doubling is discussed. N. M. B.

Band spectra of ionised halogen hydrides. III. Fine structure and isotope effects in hydrogen chloride and deuterium chloride spectra. Term schemes. F. NORLING (Z. Physik, 1937, 106, 177—204).—A theoretical discussion. L. G. G.

Spectrum of thallium fluoride. H. G. HOWELL (Proc. Roy. Soc., 1937, A, 160, 242—253).—Absorption and emission spectra of TlF have been photographed and analysed. A doublet and singlet band system and three continua are found in the region 2000—3100 Å. No sign of ^{203}Tl is detected.

G. D. P.

Molecular emission spectra of metallic salts. P. MESNAGE (Compt. rend., 1937, 204, 1929—1931).—Under the conditions employed (cf. A., 1935, 1051), CrBr_3 , NiI_2 , and MnI_2 did not afford mol. emission spectra. With NiBr_2 , band spectra were emitted at 3900—5100 Å. and there was a max. of continuous emission at 5700 Å. With CoBr_2 , band spectra were emitted at 4340—4900 and 5400—5750 Å.

J. G. A. G.

Absorption spectrum of solid anhydrous cobalt chloride. O. R. HOWELL and A. JACKSON (J.C.S., 1937, 973—979).—An investigation and comparison of the bands of the solid deposited on filter-paper and of solutions in aq. HCl confirms the view that the blue colour is typical of association of the Co ion with four Cl ions, and the red colour of association with six groups. The transition red—blue in the range liquid air temp.—350° does not accord with the visual appearance owing to the variation of intensity of the relative amounts of Co in the respective forms. The conversion with rise of temp. is comparable with that of the salt in aq. HCl or aq. MgCl_2 and is attributed to increasing association of Co with four Cl ions. Crystal structure determination by the powder method shows no indication of such change. The absorption spectrum of the solid salt deposited on various supports shows that different bands are enhanced by different surfaces.

N. M. B.

Available surface of cellulose. O. R. HOWELL and A. JACKSON (J.C.S., 1937, 979—982).—With a view of determining the available or real surface of cellulose fibre, the absorption spectrum of solid CoCl_2 deposited in different amounts on filter-paper was measured. Absorption max.—deposit curves show discontinuity corresponding with the formation of a primary covering, and evidence that this is unimol. is given. The calc. available surface is 85 times as great as the total apparent surface obtained by measurements of the constituent fibres under a microscope. Results are discussed in relation to the granular theory of cellulose.

N. M. B.

Absorption spectra of solutions of some halides and oxyhalides of sulphur, selenium, and tellurium. R. SAMUEL and M. USMAN (Proc. Indian Acad. Sci., 1937, 5, A, 425—432).—The absorption spectra $\lambda > 2400$ Å. of SOBr_2 , SeOCl_2 , SeBr_4 , TeBr_2 , TeI_2 , and Se_2Br_2 dissolved in neutral solvents are similar to those found in the vapour state (A., 1936, 775). The Te—I bond energy is 36 kg.-cal. per mol.

F. J. L.

Absorption spectrum of phosphorus pentaselenide vapour. M. I. HAQ and R. SAMUEL (Proc. Indian Acad. Sci., 1937, 5, A, 423—424). The two long-wave limits are $\lambda\lambda$ 3420 and 2534 Å., λ_{max} 2780 Å.; the energy difference is 1.3 e.v. ($^1D - ^2P$ of Se = 1.18 e.v.). The two regions of selective

absorption probably correspond with the dissociation processes $0.5\text{P}_2\text{Se}_5 \rightarrow 0.5\text{P}_2\text{Se}_3 + \text{Se}$ (2P); $0.5\text{P}_2\text{Se}_5 \rightarrow 0.5\text{P}_2\text{Se}_3 + \text{Se}$ (1D).

F. J. L.

Energy of dissociation of carbon monoxide. R. SCHMID and L. GERÖ (Z. physikal. Chem., 1937, B, 36, 105—128; cf. this vol., 279).—Consideration of the absorption spectrum leads to the dissociation scheme $\text{CO} + 11.06$ volts $\rightarrow \text{C}$ (5S) + O (3P). This scheme also agrees with the results of electron collision experiments in CO and CO_2 . The val. 170.2 kg.-cal. is calc. for the at. heat of vaporisation of solid C. This leads to CN ($X^2\Sigma$) $\rightarrow \text{C}$ (5S) + N (4S) — 182.6 \pm 5 kg.-cal., a result which seems to be supported by the distribution of perturbations in the $B^2\Sigma$ state. The above dissociation scheme also permits an interpretation of the ultra-violet absorption spectra of CO and CO_2 .

R. C.

Completion of the term schemes of carbon monoxide. II. R. SCHMID and L. GERÖ (Z. Physik, 1937, 106, 205—211).—A continuation of earlier theoretical work (this vol., 279).

L. G. G.

Absorption spectra and photochemistry of polyatomic molecules containing alkyl radicals. V. Vibration frequencies and structure. H. W. THOMPSON and J. W. LINNETT (Proc. Roy. Soc., 1937, A, 160, 539—562; cf. A., 1936, 1443).—The vibration frequencies of metallic alkyl compounds are considered. It is shown that with ZnMe_2 and HgMe_2 a valency force field is more satisfactory than a central force, and that the experimental data are consistent with a linear structure. The bearing of the results on certain chemical problems is discussed.

G. D. P.

Optical absorption of porphyrins. XI. A. STERN and M. DEZELIĆ (Z. physikal. Chem., 1937, 179, 275—294; cf. this vol., 165).—Introduction of two OH into the 5 : 6 position of the chlorin system shifts the band max. towards the red, but otherwise has little effect on the band spectrum, which remains of the "chlorin" type. Dihydroxychlorin and dihydroxy-*p*-chlorin have different absorption spectra which suggest that the steric relations between these isomerides are similar to those between the corresponding unoxidised compounds. The absorption curves of the dihydroxyporphyrins (I) are of the "porphin" type, indicating oxidation, not at the β -positions of the nuclei of the porphin system (II), but at the methine bridges. From the similarity between the effects on the absorption spectrum of introduction of Me and OH into the methine bridges of (II) and the effects accompanying similar substitutions in C_6H_6 it is inferred that the OH in (I) are attached to the γ - and δ -C atoms. The absorption spectra of solutions of mono- and di-hydroxyporphyrins vary little with the solvent. The changes occurring in porphyrin solutions in light apparently consist in photo-oxidation proceeding by way of (I). In acid solutions the absorption spectra of (I) differ considerably from those of the corresponding porphyrins, presumably owing to modification of the basic character of the porphyrin complex by the OH. The absorption spectrum of mesorhodin Me ester (III) (fluorescent) is of the "porphyrin" type. In solution equilibrium seems to be established between

(III) and the corresponding mesoverdin (non-fluorescent). R. C.

Near infra-red absorption spectrum of heavy water. L. KELLNER (Proc. Roy. Soc., 1937, A, 159, 410—415).—The absorption of liquid D_2O in the range 0.9 to 2.1 μ has been measured. Four absorption bands are observed and ascribed to overtones and combination tones of three fundamental frequencies.

G. D. P.

Rotation of water molecules in carbon disulphide solution. E. L. KINSEY and J. W. ELLIS (Physical Rev., 1937, [ii], 51, 1074—1078).—The absorption spectrum of H_2O dissolved in CS_2 (1 m. length) was investigated for four combination bands corresponding with those found in the vapour state. A correlation is made between the solution and vapour bands with and without the assumption of vapour-solution shift. Results in each case indicate that the mol. in the solution is freely rotating. The existence of line structure in the solution spectrum is undecided. In the 3 μ region a doublet in the solution of components at 2.80 and 2.65 μ is found.

N. M. B.

Infra-red absorption of mixtures of water and organic liquids. D. WILLIAMS, T. GATICA, and W. GORDY (J. Physical Chem., 1937, 41, 645—649).—The infra-red absorption spectra of $MeOH-H_2O$, $PrOH-H_2O$, and glycerol- H_2O mixtures have been measured. It is concluded that the intense bands at 2.8 μ and the weaker bands at 6.1 μ are due to H_2O mols. which have been distorted by the solvent mols. Even in mixtures containing only 5% of H_2O a considerable no. of these distorted mols. are associated in a manner similar to that in the liquid H_2O state, as is shown by the existence of the 4.7 μ absorption. No evidence of the distortion of alcohol mols. was found.

O. J. W.

Effect of hydrogen bonding on the infra-red absorption of the hydroxyl group. A. M. BUSWELL, V. DEITZ, and W. H. RODEBUSH (J. Chem. Physics, 1937, 5, 501—504; cf. this vol., 110).—Aq. solutions of *o*- $NO_2 \cdot C_6H_4 \cdot OH$ (I), 2:4-dinitroresorcinol, 2:4- and 2:6- $(NO_2)_2C_6H_3 \cdot OH$, 2:4:6- $(NO_2)_3C_6H_2 \cdot OH$, Me salicylate (II), salicylaldehyde, and *o*-nitroanisole, and solutions of (I) in CS_2 and C_2Cl_4 all show a strong absorption max. at about 3350 cm^{-1} . After keeping in contact with D_2O , (I) and (II) show a decrease in the intensity of this band and formation of a new max. at 2440 cm^{-1} , attributable to replacement of OH by OD. The absorption spectra of aq. $MeOH$, $EtOH$, Bu^+OH , and $CH_2Ph \cdot OH$ show a decrease in the intensity of the 3700 cm^{-1} band with increasing alcohol concn. whilst a band appears at 3400 cm^{-1} of intensity \gg that of the 3700 cm^{-1} band. This is interpreted as indicating intermol. H bonds.

J. W. S.

Assignment of the δ_{CH_2} frequencies in the ethylene molecule. T. Y. WU (J. Chem. Physics, 1937, 5, 600—601).—Theoretical considerations support the view of Sutherland and Dennison that of the fundamental frequencies of C_2H_4 , $\nu_{CH_2} = 1623$ and $\nu_{CH_2} = 1342$ cm^{-1} , respectively (cf. A., 1935, 569). This causes certain changes in the vals. of the frequencies for C_2H_5D and C_2D_4 (this vol., 397).

J. W. S.

Infra-red spectrum and internuclear distances of methylacetylene. R. M. BADGER and S. H. BAUER (J. Chem. Physics, 1937, 5, 599).—The spectrum of $CMe \cdot CH$ has been measured over the range 7500—11,500 \AA ., and the 10,304 \AA . band re-investigated in detail. The results confirm previous data (this vol., 166), and it is concluded that the short C—C distance, 1.463 \AA ., indicated for this compound is real. This is in accord with the observation that the bond force const. in these compounds is $>$ the val. expected for a C—C distance of 1.54 \AA . (*ibid.*, 219).

J. W. S.

Infra-red and Raman spectra of chlorobromomethanes. J. LECOMTE, H. VOLKINGER, and A. TCHAKIRIAN (Compt. rend., 1937, 204, 1927—1929).—The Raman frequencies are: CCl_3Br 187, 243, 289, 418, 710, 765, CCl_2Br_2 141, 164, 230, 252, 318, 370, 672, 720, 759, and $CClBr_3$ 139, 210, 266, 326, 674, 734 cm^{-1} . The infra-red frequencies between 500 and 1400 cm^{-1} are: CCl_3Br 717, 764, CCl_2Br_2 680, 727, 764, and $CClBr_3$ 667, 740 cm^{-1} .

J. G. A. G.

Werner complexes. Dissimulation of the N—H vibration in ammine complexes. (MME.) M. FREY-MANN and J. P. MATHIEU (Bull. Soc. chim., 1937, [v], 4, 1297—1300).—Aq. solutions of $[Pt(NH_3)_3C_5H_5N]Cl_2$ and *cis*- $[Pt(NH_3)_2(C_5H_5N)_2]Cl_2$ do not show the absorption band at 1.04 μ and the Raman frequencies characteristic of NH_3 (cf. A., 1935, 563; this vol., 219). An anomaly is explained (A., 1931, 1353; this vol., 168).

J. G. A. G.

Raman spectra of crystal powders. V. I. Inorganic nitrates. II. Water of crystallisation. R. ANANTHAKRISHNAN (Proc. Indian Acad. Sci., 1937, 5, A, 447—462).—I. The Raman spectra of $NaNO_3$, KNO_3 , NH_4NO_3 , $Pb(NO_3)_2$, $Sr(NO_3)_2 \cdot 4H_2O$, $Ca(NO_3)_2 \cdot 4H_2O$, $Cd(NO_3)_2 \cdot 4H_2O$, $Mg(NO_3)_2 \cdot 6H_2O$, $Cu(NO_3)_2 \cdot 3H_2O$, $Ce(NO_3)_3 \cdot 6H_2O$, and $Bi(NO_3)_3 \cdot 5H_2O$ have been photographed using the technique of complementary filters. The main nitrate frequency is 1050 cm^{-1} , intense and sharp in all nitrates, and a less intense line 710—755 cm^{-1} . The interval 1100—1600 cm^{-1} is complex, and depends on nature of cation, no. of H_2O of crystallisation, and crystal structure.

II. The spectra of Mg , Ca , Cd , Cu , Ce , and Bi nitrates, Sr , Mg , and Mn chlorides, $CuSO_4 \cdot 5H_2O$, $NaVO_4 \cdot 12H_2O$, $Na_3PO_4 \cdot 12H_2O$, $Na_2CO_3 \cdot 10H_2O$, and $Na_2B_4O_7 \cdot 10H_2O$ all differ widely from one another. The H_2O of crystallisation gives rise to Raman frequencies between 3150 and 3650 cm^{-1} .

F. J. L.

Relation between Raman frequencies and interatomic distances. P. DONZELOT and J. BARRIOL (Compt. rend., 1937, 204, 1867—1868).—The plot of "reduced" frequency against internuclear distance is a straight line. Methods of obtaining the "reduced" frequencies are outlined.

W. R. A.

Raman spectrum of monodeuteroethylene. J. M. DELFOSSE, J. C. JUNGERS, G. LEMAITRE, Y. L. TCHANG, and G. MANNEBACK (Nature, 1937, 139, 1111—1112).—Calc. data for C_2H_4 , C_2H_3D , C_2D_4 and observed data for C_2H_3D are tabulated and discussed. Calc. and observed frequencies for C_2H_3D agree to within 1.5%.

L. S. T.

Raman spectra of amino-acids and related compounds. IV. **Ionisation of di- and tri-carboxylic acids.** J. T. EDSALL (J. Chem. Physics, 1937, 5, 508—517; cf. A., 1936, 269; this vol., 168, 282).—Raman frequencies are recorded for aq. solutions of $\text{H}_2\text{C}_2\text{O}_4$, $\text{K}_2\text{C}_2\text{O}_4$, $\text{CH}_2(\text{CO}_2\text{H})_2$, $\text{CH}_2(\text{CO}_2\text{H})(\text{CO}_2\text{Na})$, $\text{CH}_2(\text{CO}_2\text{Na})_2$, $\text{CD}_2(\text{CO}_2\text{D})_2$, $\text{CD}_2(\text{CO}_2\text{Na})_2$, crotonic acid, Na crotonate, Na_2 maleate, Na_2 fumarate, *d*- and *meso*-tartaric acids, Na_2 *d*-tartrate, *l*-aspartic acid hydrochloride, Na *l*-aspartate, *d*-glutamic acid hydrochloride, Na *d*-glutamate, tricarballic acid, Na_2 tricarballylate, citric acid, and Na_2 citrate, together with preliminary data for NH_2 -acids. The strong CO_2H frequency at about 1700 cm^{-1} vanishes on ionisation, and the ions show one or more intense polarised lines near 1400 cm^{-1} , which are almost unaffected by D substitution and probably correspond with a symmetrical valency oscillation of the CO_2' group. Deformation frequencies in the same region and due to CH_2 and Me groups are changed by D substitution. Most of the substances show strong polarised lines at 700 — 950 cm^{-1} , which are increased in frequency by 30 — 50 cm^{-1} on ionisation and depressed by D substitution. Frequencies below 600 cm^{-1} , which are almost unaffected by ionisation or D substitution, are attributed to bending or twisting vibrations.

J. W. S.

Light scattering, Raman spectra, and allied physical properties of some essential and vegetable oils. C. DAKSHINAMURTI (Proc. Indian Acad. Sci., 1937, 5, A, 385—406).—The adiabatic and isothermal compressibility, sp. vol. for various temp., sp. heat at const. pressure, n , rotation of plane of polarisation, depolarisation factor, intensity of scattered light, and Raman spectra of eucalyptus, cajeput, coriander, anise, citronella, sandal, coconut, groundnut, and castor oils are recorded. The intensity of the scattered light indicates that its origin is mol., and the Raman spectra show that the accepted chemical constitutions of the oils are correct.

F. J. L.

Formation and mode of action of light-sensitive zinc sulphide and other luminophores. N. RIEHL (Ann. Physik, 1937, [v], 29, 636—664).—A survey of recent work.

H. C. G.

Ionisation potentials of free radicals methyl and ethyl. R. G. J. FRASER and T. N. JEWITT (Proc. Roy. Soc., 1937, A, 160, 563—574).—A beam of free radicals, formed by thermal decomp. of Pb tetra-alkyl, is admitted to an ionisation gauge. From the ion current the ionisation potentials are deduced (Me 11.2, Et 10.6 volts ± 0.8).

G. D. P.

Photo-electric measurements with metallic antimony. R. SUHRMANN and W. BERNDT (Z. Physik, 1937, 106, 354—357; cf. Middel, this vol., 395).—Middel's films of Sb must have contained some non-metallic Sb. The internal photo-electric effect in metallic conductors is vanishingly small.

H. C. G.

New kind of permanent polarisation of dielectrics. G. NADJAKOFF (Compt. rend., 1937, 204, 1865—1866).—By subjecting a dielectric to the simultaneous action of illumination and an electric field a new type of polarisation (permanent photo-

polarisation) is induced. This is maintained indefinitely if the dielectric is kept in the dark after removal of the electric field. Its magnitude can be measured from the current produced in an ionised gas under standard conditions of illumination of the photo-cell.

W. R. A.

Effect of heat on the uni-polar electrical conductivity of carborundum. M. K. CHAKRAVARTY and S. R. KHASTGIR (Phil. Mag., 1937, [vii], 24, 127—141; cf. A., 1935, 148, 682).—The effect of change of temp., between 300° and 800° abs., on the conductivity of a carborundum crystal in two opposite directions has been studied. κ increases exponentially with temp. The ratio of the two vals. of κ rises or falls with temp., or shows a max. val. The results are interpreted on the basis of the Wilson-Fowler electron theory of semi-conductors.

A. J. E. W.

Dependence of dielectric loss on constitution and size of molecule of ketones. W. HOLZMULLER (Physikal. Z., 1937, 38, 574—587).—The dielectric loss of a no. of aliphatic and cyclic ketones in non-polar solvents was determined by finding the heat produced when the solutions were placed in a high-frequency field. The calc. relaxation time increases with increasing size of the ketone mol., and is different for two ketones of the same moment but different structure. The effects of solvent and dipole association are considered. The results can be explained by the dipole theory. The agreement with theory is better for the larger mols.

A. J. M.

Theory of electrical breakdown in ionic crystals. H. FROHLICH (Proc. Roy. Soc., 1937, A, 160, 230—241).—From the time of relaxation of an electron in an ionic lattice the crit. field, F , for electrical breakdown is calc. Agreement with experiment is obtained. F increases with rising temp. and if foreign atoms are introduced into the lattice. The theory also indicates an increase in F for layers about 10^{-6} cm . thick.

G. D. P.

Dielectric constant of mixed crystals of sodium ammonium and sodium potassium tartrates. R. C. EVANS (Phil. Mag., 1937, [vii], 24, 70—79).—Vals. of ϵ for a complete series of mixed crystals, obtained in the frequency range 50 — 2000 kc ., are recorded. For the Na NH_4 salt, $\epsilon = 8.2$. No variation of ϵ with frequency occurs in the above range.

A. J. E. W.

Dielectric constants of solutions of some alcohols in benzene. V. I. ROMANOV and I. A. ELTZIN (Physikal. Z. Sovietunion, 1937, 11, 526—538).—The dielectric consts. of MeOH, Bu^oOH, *n*- and *iso*- $\text{C}_5\text{H}_{11}\text{OH}$ in C_6H_6 have been determined for λ 57.75 cm., and the mol. polarisations have been calc. The electric moments are obtained and compared with those for a static field. The deviation is considerable, except in the case of MeOH, the vals. agreeing more closely with those calc. for the absorption max.

A. J. M.

Dipole moments of hydrazides. P. R. FREY and E. C. GILBERT (J. Amer. Chem. Soc., 1937, 59, 1344—1347).—Vals. of μ for benzoyl-, α - β -dibenzoyl-, α -benzoyl- β -*p*-toluoyl-, α -benzoyl- β -*p*-chlorobenzoyl-, and α -benzoyl- β -*p*-nitrobenzoyl-hydrazide, azodi-

benzoyl, and 2:5-diphenylfurazan are 2.70, 2.63, 3.38, 3.82, 5.57, 2.85, and 3.45, respectively.

E. S. H.

Raman effect and dipole moment in relation to free rotation. VIII. Molecular structure of carbonic esters. M. KUBO, Y. MORINO, and S. MIZUSHIMA (Sci. Papers Inst. Phys. Chem. Tokyo, 1937, 32, 129—137).—The dipole moment of Et_2CO_3 is 1.07 (79—204°) and of Me_2CO_3 0.86—1.00 (55—206°). There is no significant single bond—double bond resonance, the normal state approximates to the classical formula, and the temp. effect in Me_2CO_3 is due to oscillation of Me groups; this is not possible in Et_2CO_3 because of mutual interaction of Et groups.

F. J. L.

Dielectric constant of cetyl alcohol near its m.p. K. HIGASHI and M. KUBO (Bull. Chem. Soc. Japan, 1937, 12, 326—327).—Data for the range —13.5° to 64° show that cetyl alcohol has a max. dielectric const. at slightly < m.p.

J. G. A. G.

Double refraction effect in certain fatty materials. L. BELLINGHAM (Nature, 1937, 140, 70).—When tested by the projection refractometer vaseline, lanoline, rubber lubricant, ordinary yellow soap, and green soft soap show two refractive indices.

L. S. T.

Origin of optical activity in nature. C. W. F. SPIERS (Naturwiss., 1937, 25, 457).—The theory of Kuhn is preferred to that of Langenbeck and Triem (cf. A., 1937, III, 29).

O. D. S.

Relative and absolute spatial configurations of optically active tri-diamine complexes of chromium, cobalt, and rhodium. F. M. JAEGER (Bull. Soc. chim., 1937, [v], 4, 1201—1220; cf. this vol., 170).—Earlier work by the author and others is discussed (cf. A., 1928, 1172). The application of Werner's solubility rule to the halogeno-*d*-tartrates shows that $D\text{-}[\text{Co}(\text{en})_3]$, $D\text{-}[\text{Cr}(\text{en})_3]$, $L\text{-}[\text{Rh}(\text{en})_3]$ (I), $L\text{-}[\text{X}(\text{d-cpn})_3]$, and $L\text{-}[\text{X}(\text{d-cxn})_3]$ have the same spatial configuration, where *D* and *L* denote rotation of resolved complex in red light, X = Co, Cr, Rh, en = $(\text{CH}_2\cdot\text{NH}_2)_2$, cpn = cyclopentanediamine, and cxn = cyclohexanediamine. Only in (I) does substitution of Co or Cr by Rh lead to inversion of rotation in the red, the configuration remaining the same. Application of Delepine's "active racemate" method (A., 1935, 65) confirms the above conclusions. The rotatory dispersions and circular dichroism of the chlorides of the above ions and of $L\text{-}[\text{Co}(\text{d-cxn})_2(\text{en})]\text{Cl}_3$ and $L\text{-}[\text{Co}(\text{d-cxn})(\text{en})_2]\text{Cl}_3$ have been determined (cf. A., 1936, 410) and when interpreted by the method of Kuhn and Bein (A., 1934, 476) lead to identical spatial configurations for all of the ions except in the case of $L\text{-}[\text{Co}(\text{d-cpn})_3]\text{Cl}_3$, which gives anomalous results, and this suggests that the method may not have the range of application hitherto supposed.

J. G. A. G.

Measurement of circular dichroism in the ultra-violet regions. I. R. TSUCHIDA (Bull. Chem. Soc. Japan, 1937, 12, 276—285).—Mathematical. A general equation (i) for use in measurements of circular dichroism (A., 1930, 1096) has been developed and the equation formerly used (*loc. cit.*) is shown to be a very special case of (i). The optical absorption, rotatory dispersion, and circular dichro-

ism of NH_4 α -bromocamphor- γ -sulphonate in the visible and ultra-violet have been determined.

J. G. A. G.

Magneto-optical properties of compressed gases: magnetic birefringence of nitric oxide. Magnetic rotatory power of helium. H. BIZETTE and B. TSAI (Compt. rend., 1937, 204, 1870—1871).—A calc. Cotton-Mouton const. for NO agrees well with the observed val. and indicates that the birefringence is max. at —57°. The Verdet const. for He at 89 kg. per sq. cm. has been measured.

W. R. A.

Anomalies in the magnetic rotatory dispersion of sulphuric acid solutions of tellurium. H. BIZETTE and M. SCHÉRER (Compt. rend., 1937, 204, 1931—1933).—The rotations due to Te were positive on both sides of the Te absorption band.

J. G. A. G.

Structure and electronic interpretation of some optically active sulfoxides.—See A., II, 373.

Polarity of chemical bonds. M. L. HUGGINS (J. Chem. Physics, 1937, 5, 527—529).—It is as valid to consider polar bonds to resonate between two covalent states as between a covalent and an ionic state. It is suggested that a H atom may be bonded simultaneously to two other atoms if they are sufficiently electronegative (*e.g.*, F), and that C or N atoms suitably surrounded by electronegative atoms can hold >4 bonding electron pairs in the valency shell. Pauling's magnetic criterion of bond type may distinguish between covalent bonds and ionic bonds.

J. W. S.

Determination of intermolecular forces in gases from their viscosities. D. BURNETT (Proc. Camb. Phil. Soc., 1937, 33, 363—370).—Theoretical.

F. J. L.

Force constants and molecular structures. C. R. BAILEY and J. B. HALE (Nature, 1937, 139, 1112).—For COCl_2 , CH_2O , and $\text{CO}(\text{NH}_2)_2$ the carbonyl force consts. are of the order 12.3, 11.5, and 10.2, respectively; the carbonyl frequency, ω_1 , for CH_2O (1744 cm^{-1}) can be regarded as the normal val., and arises from a pure double linking. $\text{CO}(\text{NH}_2)_2$ (ω_1 — 1655 cm^{-1}) has a considerable single linking contribution, but COCl_2 (ω_1 — 1827 cm^{-1}) has a marked triple linking effect.

L. S. T.

Rotation and vibration of linear triatomic molecules. A. WEINBERG and C. ECKART (J. Chem. Physics, 1937, 5, 517—522; cf. A., 1935, 685).—Mathematical. The wave equation of the triat. mol. is derived and its approx. solution is discussed.

J. W. S.

Determination of the constants of harmonic vibrations. O. REDLICH and H. TOMPA (J. Chem. Physics, 1937, 5, 529—538; cf. A., 1935, 685).—Mathematical. The method of relating the consts. of potential energy and frequency of potential systems for harmonic vibrations is developed.

J. W. S.

Re-determination of the carbon-oxygen distance in calcite and the nitrogen-oxygen distance in sodium nitrate. N. ELLIOTT (J. Amer. Chem. Soc., 1937, 59, 1380—1382).—X-Ray investigation gives 1.313 Å. for the C—O distance and 1.210 Å. for

the N—O distance. The latter val. is discussed in relation to the effect of resultant charge of an atom on its covalent radius. E. S. H.

Valency angle and radius of action of bound atoms. H. A. STUART (Z. physikal. Chem., 1937, B, 36, 155—162).—Existing data for internuclear distances and valency angles for mols. of the types AX_2 and AX_3 indicate that valency angles $>$ the 90° required by wave mechanical theory for O, S, and N, e.g., 110° for O, are due to repulsive forces between the X atoms. Interat. repulsive forces appear inadequate to effect any appreciable deformation of electron envelopes. R. C.

Quantum theory of atomic polarisation. I. Polarisation by a uniform field. II. Van der Waals energy of two atoms. R. A. BUCKINGHAM (Proc. Roy. Soc., 1937, A, 160, 94—113, 113—126).—I. The at. polarisability of several atoms containing closed electron groups is calc. from their self-consistent fields. An antisymmetrical wave function gives better results than a symmetrical function.

II. The method developed above is used to calc. the mutual energy of an atom polarised by another distant atom. The dipole-dipole const. is related to the at. polarisability, and is calc. for rare gas atoms and for alkali ions in crystals. G. D. P.

Role of dipole-dipole coupling in dielectric media. J. H. VAN VLECK (J. Chem. Physics, 1937, 5, 556—568; cf. this vol., 353).—Mathematical. It is shown that the Lorentz expression for the local field ($E + 4\pi P/3$) and the Clausius-Mossotti formula are only first approximations, valid at low density. A Gaussian approximation or a formula based on Onsager's theory does not allow the electric analogue of ferromagnetism in polar liquids, demanded by the Clausius-Mossotti law. Hence the hypothesis of hindered rotation may not be necessary to explain the absence of spontaneous polarisation and great saturation curvature in strong fields. Kirkwood's calculations (A., 1936, 1321) of the translational fluctuation effect are extended to include polar mols. and accord with measurements on NH_3 (A., 1931, 147; 1934, 11). J. W. S.

Surface tension of deuterium oxide and of its mixtures with water. G. JONES and W. A. RAY (J. Chem. Physics, 1937, 5, 505—508).—The surface tension (γ) of D_2O - H_2O mixtures (22—97% D_2O) $\propto 1 - 0.00501\Delta s$ (Δs = change in d from that of pure H_2O). By extrapolation γ for pure D_2O is calc. to be 0.99946 that of H_2O . J. W. S.

Surface tension of water and heavy water. J. TIMMERMANS and H. BODSON (Compt. rend., 1937, 204, 1804—1807; cf. A., 1936, 557).—Vals. of γ for H_2O , obtained by capillary-ascent, bubble-pressure, and drop-wt. methods, and vals. for D_2O obtained by a capillary-ascent method, are given for temp. $> 40^\circ$. The γ/T curves show an anomalous flattening at 13° for H_2O and at 17° for D_2O . A. J. E. W.

Polyhalides. V. Structure of polyhalides. S. K. RAY and D. MAJUMDAR (J. Indian Chem. Soc., 1937, 14, 197—207).—Parachor measurements indicate that the bonds between the halogens in NEt_4I_3 , $NEt_4I_2Br_2$, $C_6H_4Br \cdot NMe_3I_2Cl_2$, $C_6H_4Br \cdot NMe_3I_2Cl$,

$C_6H_4Br \cdot NMe_3Br_3$, and NEt_4IBrCl_3 are electron-pair and not singlet links. Structures are suggested.

F. J. L.

Parachors of polycyclic compounds. II. D. N. KURSANOV and V. S. GORIATCHEV (J. Gen. Chem. Russ., 1937, 7, 1096—1101; cf. A., 1935, 15).—The parachors of monocyclic compounds with a double linking are in agreement with theory, whilst those of similar dicyclic compounds are consistently $<$ theoretical. R. T.

"Detour-excitation," a hitherto unnoticed retroaction phenomenon in grating interference. M. RENNIGER (Z. Physik, 1937, 106, 141—176).—A discussion of the reinforcing effect of secondary internal reflexion, due to the primary radiation, on the diffracted X-radiation from diamond. The lattice const. of diamond obtained from a consideration of this effect is 3.55948 ± 0.00010 A. L. G. G.

Theory of fine structure in the X-ray absorption spectra of triatomic molecules. B. V. BOGDANOVITSCH (Physikal. Z. Sovietunion, 1937, 11, 513—525).—An exact formula for the fine structure in X-ray absorption spectra of triat. mols. is derived on the basis of Petersen's generalisation (A., 1932, 892; 1933, 332; 1936, 399) of Kronig's theory (A., 1932, 553). The scattering of the electron wave by a system of two atoms is considered. Axial symmetry of mols. has little effect on the fine structure function. A. J. M.

Uses and limitations of X-ray diffraction methods. J. T. NORTON (J. Appl. Physics, 1937, 8, 307—312).—A discussion. H. J. E.

The liquid state. K. F. HERZFELD (J. Appl. Physics, 1937, 8, 319—327).—A review. H. J. E.

Cathode sputtering of copper in light and heavy hydrogen. A. GÜNTHER-SCHULZE (Z. Physik, 1937, 106, 371—372).—At 2000 volts cathode sputtering of Cu in D_2 is the same as in H_2 . H. C. G.

Nature of the boundary surface of selenium film cells. P. GÖRLICH (Z. Physik, 1937, 106, 373—378).—Cathode sputtering of the Se surface with Pt or Ag gives greater sensitivity than evaporation in vac. The Se surface appears to be covered with a thin layer of Se oxides and adsorbed gas atoms. H. C. G.

Comparison of cathode sputtering of pure and oxide-coated magnesium surfaces. A. GÜNTHER-SCHULZE and H. BETZ (Z. Physik, 1937, 106, 365—370).—Sputtering from an oxide-coated Mg cathode is only 0.4% of that from pure Mg. Equally small is that from Mg in H_2 , whilst in He no sputtering occurs. The reduction when impurities are present on the surface is due to the expulsion of Mg ions, which return to the cathode, instead of Mg atoms. L. G. G.

Effect of temperature on the intensity of reflexion of X-rays from zinc crystals. E. O. WOLLAN and G. G. HARVEY (Physical Rev., 1937, [ii], 51, 1054—1061).—Measurements of intensity at room and liquid-air temp. show that the at. structure factors of Zn at these temp. depend on the orientation of the plane from which reflexion takes place. The temp. factor for the various planes has been deter-

mined, and hence the structure factor for the atom at rest is calc. There is evidence that the Zn atoms in the crystal do not possess spherical symmetry but are drawn out in the direction of the *c* axis. The amplitude of thermal vibration of the atoms along various directions in the crystal has been determined, and general deductions agree with those from sp. heat data. N. M. B.

Atomic structure and vibrations in zinc crystals. IV. Diffuse scattering of X-rays at different temperatures. G. E. M. JAUNCEY and W. A. BRUCE. V. Diffuse scattering of X-rays at various scattering angles. W. A. BRUCE and E. M. McNATT. VI. Determination of electron asymmetry and the two principal characteristic temperatures. G. E. M. JAUNCEY and W. A. BRUCE (Physical Rev., 1937, [ii], 51, 1062—1065, 1065—1067, 1067—1073; cf. A., 1936, 1325).—IV. Crystal surfaces must be plane to 10^{-5} cm. for reliable results, and methods of annealing and polishing to attain this are described. Measurements for orientations of 3° and 90° at a scattering angle of 30° were made in the temp. range 100—550° abs. A method of obtaining the ratio of the mean square displacement parallel to that perpendicular to the principal axis is described.

V. Former measurements at room temp. are repeated with higher accuracy in order to obtain evidence on electron asymmetry.

VI. A detailed analysis and discussion of the above and an examination of at. structure factor vals.

N. M. B.

Influence of alternating stresses on the crystal structure of metals. F. WEVER and H. MOLLER (Naturwiss., 1937, 25, 449—453).—The change during alternating bending in the structure of a single crystal-lite at the breaking point of a rod of mild steel (0.02% C) has been followed by X-ray diffraction. No alteration was observed with strains the static tensile strength. Above the static strength small disturbances appear. Large disturbances are first observed at the breaking point just before fracture. Results agree with those of Gough and Wood (B., 1936, 841) but disagree with those of Barrett (*ibid.*, 890). O. D. S.

Non-metallic and random structure of metal films. R. SUHRMANN and W. BERNDT (Naturwiss., 1937, 25, 457—458; cf. this vol., 19).—The change of structure of thin condensed films of Fe, <10 mμ thick, from a half-conducting non-metallic state to a random, and finally to an ordered, metallic structure has been observed. Previous work is summarised and discussed. O. D. S.

Dependence of the shift-rate of the planes of a growing crystal on the surroundings. E. ERNST (Z. Krist., 1937, 96, 38—77).—Artificially-ground spherical crystals of rock-salt are hung in a slightly supersaturated aq. solution under controlled conditions of temp., evaporation, and stirring, and the formation and shift-rate of the different planes observed by direct measurement. Growth curves are given in detail, and relationships sought between area of face, edge length, and shift-rate. B. W. R.

Recent knowledge on crystal growth and seed crystal formation. I. N. STRANSKI (Trav. Congr. Jubil. Mendeleev, 1937, 2, 185—196).—A brief description of the author's mathematical theory (cf. A., 1934, 946, 1058, 1059; 1935, 816, 1059).

C. R. H.

Quasi-crystalline structure of liquids and solutions. Debye rotational hindrance, van Arkel association, and the "state" of liquids. F. H. MULLER (Physikal. Z., 1937, 38, 498—510).—Theoretical. The Debye rotational coupling energy is considered. A. J. M.

Surface layer of polished silica and glass: optical contact. (LORD) RAYLEIGH (Proc. Roy. Soc., 1937, A, 160, 507—526).—The reflecting power of a surface of SiO₂ examined in a liquid of the same *n* as the body of the material depends on its method of prep. Surfaces prepared by a process which removes material rapidly or by washing in dil. HF do not reflect appreciably. If the polishing process does not remove material quickly the surface reflects as much as 0.28% of the incident light. *n* of the surface film may rise to 1.6. Similar, though less marked, effects are observed in glass and crystal quartz. The thickness of the layer is 341 Å. The variable reflecting power at the interface of SiO₂ or glass surfaces in optical contact can thus be controlled. Surfaces of crystal quartz in optical contact are separated by a distance about 7 times the crystal spacing.

G. D. P.

Physical properties of surfaces. IV. Polishing, surface flow, and the formation of the Beilby layer. F. P. BOWDEN and T. P. HUGHES (Proc. Roy. Soc., 1937, A, 160, 575—587; cf. B., 1936, 842).—The relative m.p. of polisher and solid are more important than their hardnesses in the process of polishing. Surface flow is produced by intense local heating causing fusion of surface irregularities, which are then smeared over the surface to form the Beilby layer.

G. D. P.

Gold-sodium compound Au₂Na. H. PERLITZ and E. ARUJA (Naturwiss., 1937, 25, 461; cf. Haucke, this vol., 127).—The side of the unit cube of Au₂Na is 7.7874+0.0002 Å. at 20°. The unit cell contains 24 atoms and is of Cu₂Mg type with 16 Au atoms in the Wyckoff layer 16(*b*) and 8 Na atoms in the layer 8(*g*). For the alloy Au 85.7, Na 14.3 at.-% the side of the unit cube is 7.770 Å. for Au₂Na and 4.046 Å. for Au. O. D. S.

Polymorphism of antimony trioxide and the structure of the orthorhombic form. M. J. BUERGER and S. B. HENDRICKS (J. Chem. Physics, 1937, 5, 600).—The high-temp. orthorhombic form of Sb₂O₃, obtainable as a metastable phase at room temp., has a space-group *Pccn*—*D*_{2h}¹⁰, with *a* 4.92, *b* 12.46, and *c* 5.42 Å., and contains 4 Sb₂O₃ mols. per unit cell. The structure can be considered as made up of double chains of alternate O and Sb, with O linking the Sb of the two chains. These Sb—O—Sb angles are 115° and 129°, respectively.

J. W. S.

Crystal structures of Cr₂Al and Cr₅Al₈. A. J. BRADLEY and S. S. LU (Z. Krist., 1937, 96, 20—37).—Cr₂Al is tetragonal, *a*₀ 2.9984, *c*₀ 8.6303 Å., space-

group $14/mmm$. Cr_5Al_8 is rhombohedral, pseudo-body-centred cubic, a_0 9.0327 Å., α 89° 16.4', space-group $R3m$. Parameters are accurately determined from intensity measurements, and the structure of Cr_5Al_8 is compared in detail with that of γ -brass (Cu_5Zn_8).

B. W. R.

Change of lattice orientation due to allotropic transformation in boracite, leucite, and anhydrous sodium sulphate crystals. H. SHÖJI (Sci. Rep. Tohoku, 1937, 26, 86—91).—In boracite and leucite crystals one of the (110) planes in the pseudo-cubic lattice becomes parallel to one of the (110) planes in the cubic form during the changes at 265° and 620°, respectively. Other corresponding planes in both lattices are also nearly parallel. In anhyd. Na_2SO_4 crystals the (0001) plane in the pseudo-hexagonal lattice at room temp. becomes parallel to the (0001) plane in the hexagonal (or another pseudo-hexagonal) lattice formed at 280°.

J. W. S.

[Crystal structures of] alkali ferrihexafluorides. W. MINDER (Z. Krist., 1937, 96, 15—19).—The elementary cells of compounds R_3FeF_6 , where R is NH_4 , Li, Na, K, Rb, and Cs, are measured and results are summarised. The space-group of the NH_4 compound was T^2 or T^2_2 ; that of the others could not be determined.

B. W. R.

X-Ray investigation of diphenylene disulphide and diphenyl disulphide. M. PRASAD, J. SHANKER, B. H. PEERMOMAHMED (J. Indian Chem. Soc., 1937, 14, 177—187).—Diphenylene disulphide is monoclinic prismatic, space-group C_{2h}^2 , with 8 mols per unit cell, polymerised in pairs forming 4 asymmetric units. Ph_2S_2 is orthorhombic bisphenoidal, space-group Q_4 , with 4 mols. per unit cell; the possibility of a centre of symmetry in the mol. is not excluded.

F. J. L.

Crystal behaviour of hydrocarbons. R. T. LESLIE and W. W. HEUER (J. Res. Nat. Bur. Stand., 1937, 18, 639—644).—The construction and operation of a microscope for observing crystal growth at low temp. are described. The crystal forms of 9 aromatic, 6 *cyclo*-paraffin, 8 *n*-paraffin, and 5 branched-chain paraffin hydrocarbons have been observed. Condensed mols. tend to crystallise in polyhedra of about equal size, whereas long-chain mols. form long prisms. Successive members of the *n*-paraffin series cannot be distinguished by crystal form, whilst hydrocarbons of different types, e.g., methylcyclohexane and β , β , β -trimethylpentane, may crystallise in very similar forms. *n*-Paraffin and aromatic hydrocarbon crystals grow more readily than those of the other types.

J. W. S.

Crystalline structure of the sugars. IV. Pentaerythritol and the hydroxyl bond. F. J. LLEWELLYN, E. G. COX, and T. H. GOODWIN (J.C.S., 1937, 883—894).—The structure of the tetragonal crystals of pentaerythritol is determined by X-ray measurements. The interat. distances within the mol. are C—C 1.50, C—O 1.46 Å., and the deviations of the bond angles from the tetrahedral angle are negligible. The structure of the lattice is of a layer type, the mols. being linked in the plane by "hydroxyl

bonds," the separation of the layers being >3.5 Å., accounting for the perfect cleavage parallel to {001}.

J. D. R.

Pattern of proteins.—See A., II, 394.

Significance of electronic diffraction in scientific and technical questions. H. MARK (Trav. Congr. Jubil. Mendeléev, 1937, 2, 69—77).—A lecture. Recent applications of electron and X-ray diffraction methods to the determination of at. and mol. structure are described.

C. R. H.

Carbon-carbon linking distances. Electron-diffraction investigation of ethane, propane, isobutane, neopentane, cyclopropane, cyclopentane, cyclohexane, allene, ethylene, isobutene, tetramethylethylene, mesitylene, and hexamethylbenzene. Revised values of covalent radii. L. PAULING and L. O. BROCKWAY (J. Amer. Chem. Soc., 1937, 59, 1223—1236).—The C—C distance has the const. val. 1.54 ± 0.02 Å. and is not affected by the presence of an adjacent double linking or C_6H_6 nucleus (if it does not form part of a conjugated system). The C=C distance is 1.34 ± 0.02 Å., which has led to a revision of the table of covalent radii. The effect of this revision on the linking distance-resonance curve is discussed.

E. S. H.

Electron diffraction investigation of the fluorochloromethanes. L. O. BROCKWAY (J. Physical Chem., 1937, 41, 747—762; cf. this vol., 222).—An amplification of previously published work. The angle Cl—C—Cl (112°) is $>$ Cl—C—F (110°) or F—C—F (110°).

F. R. G.

Molecular structures of the $\beta\gamma$ -epoxybutanes. Correction. L. O. BROCKWAY and P. C. CROSS (J. Amer. Chem. Soc., 1937, 59, 1147—1148; cf. this vol., 119).—The previously reported electron diffractions of *cis*- and *trans*- $\beta\gamma$ -epoxybutane are confirmed and shown to be in accord with the chemical assignment of configurations if the valency strain of the three-membered ring is distributed over the other linkings. This is held to be proof of such distribution of strain.

R. S. C.

Electron diffraction investigation of some inorganic halides. A. H. GREGG, G. C. HAMPSON, G. I. JENKINS, P. L. F. JONES, and L. E. SUTTON (Trans. Faraday Soc., 1937, 33, 852—874).—From electron diffraction data for PBr_3 , PI_3 , AsBr_3 , AsI_3 , SbCl_3 , SbBr_3 , SbI_3 , HgCl_2 , HgBr_2 , HgI_2 , HgMe_2 , and BCl_3 the distances between the central and attached atoms have been obtained. The covalency angles for the halides of P, As, and Sb are approx. 100° and for HgI_2 , $<160^\circ$. The data, together with those of other workers, show that the observed interat. distances of PI_3 , AsI_3 , and SbI_3 are $<$ the vals. calc. by summing the Pauling-Huggins covalent radii, whilst for the other halides the observed vals. are $<$ those calc., the difference increasing in the order bromide $<$ chloride $<$ fluoride. For Hg halides the differences between observed and calc. vals. increase in the reverse order. The possible causes of the differences are discussed.

C. R. H.

Crystal structure of sputtered nickel films. S. OGAWA (Sci. Rep. Tohoku, 1937, 26, 93—105).—Electron diffraction measurements indicate that Ni

films sputtered in H_2 are of non-magnetic hexagonal close-packed I (cf. A., 1933, 1234; 1934, 353) which is converted into face-centred cubic I on annealing in a vac. at 320° . Films formed by cooled sputtering in H_2 or N_2 show diffuse patterns, but yield hexagonal close-packed I and II, respectively, on annealing at 200 – 250° . On annealing at higher temp. the amount of adsorbed gas decreases, and hexagonal I yields cubic I and hexagonal II yields successively cubic II and cubic I. The magnetic susceptibility of films produced by cooled sputtering in H_2 increases with increasing film thickness, this being accompanied by superposition of the cubic on the hexagonal lattice. Films of hexagonal I obtained by non-cooled sputtering are non-ferromagnetic up to thicknesses of 5×10^{-5} cm. owing to gas absorption. J. W. S.

Electron theory of metals. K. ARIYAMA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 103–119).—A theoretical discussion of the ferromagnetic properties of metals. F. J. L.

Piezodielectric effect and electrostriction in anisotropic or isotropic media. H. OSTERBERG and J. W. COOKSON (Physical Rev., 1937, [ii], 51, 1096–1101).—Mathematical. N. M. B.

Pyroelectric behaviour of picric acid crystals. G. GREENWOOD (Z. Krist., 1937, 96, 81–84).—Large crystals of picric acid were obtained by very slow crystallisation from EtOH, and were tested for pyroelectricity by a variety of methods. A negative result was obtained, agreeing with the fact that this substance has so far not been found to be piezoelectric. B. W. R.

Magneto-resistance effect in cadmium at low temperatures. C. J. MILNER (Proc. Roy. Soc., 1937, A, 160, 207–229; cf. this vol., 227).—The increase of electrical resistance of polycryst. Cd specimens of differing degrees of purity has been measured in fields up to 26 kilogauss. Above 20° abs. the linear variation of resistance with field was confirmed. A new effect was observed at 4.2° abs., where in addition to the linear effect a square law increase was observed, the increase of resistance with field being represented by $aH^2 + bH$. The const. a falls rapidly as the temp. rises above 4° abs. and is dependent on the purity of the specimen. b is approx. const. The results are compared with those of other workers. G. D. P.

Properties of the surface magnetisation in ferromagnetic crystals. W. C. ELMORE (Physical Rev., 1937, [ii], 51, 982–988).—The magnetic powder patterns on polished Fe crystals have been studied with the help of a macroscopic model and by investigating the forces on the powder particles. Evidence is given that the structures originate during polishing, but that causes other than magnetic must be responsible for the regularity of the patterns. N. M. B.

Hysteresis of magnetostriction of iron, nickel, cobalt, and single crystals of iron. Y. MASIYAMA (Sci. Rep. Tôhoku, 1937, 26, 1–39).—The hysteresis of magnetostriction of Fe, Ni, and Co polycrystals and of Fe single crystals has been investigated by varying the field (H) gradually or suddenly. After sudden withdrawal of H the residual elongation is \gg , and

H H (A., I.)

the residual magnetisation $<$, after reducing H slowly to zero. The anomaly can be explained by the rotational inertia of elementary complexes. The effects with polycrystals are the resultant of those of the constituent microcrystals. J. W. S.

Hysteresis of magnetostriction for alloys of the systems iron-nickel, nickel-cobalt, and iron-cobalt. Y. MASIYAMA (Sci. Rep. Tôhoku, 1937, 26, 65–85; cf. preceding abstract).—Hysteresis of magnetostriction and magnetisation in Fe-Ni, Ni-Co, and Fe-Co alloys occur over a wide range of field strength (H), when this is varied slowly. For all the alloys investigated the descending and ascending branches of the magnetostriction- H curves show max. in weak fields, but in alloys containing 20, 50, and 70% of Fe they show min. near where $H = 0$. J. W. S.

Effect of temperature on the discontinuous process of magnetisation in nickel and nickel-iron alloy (40% Ni). M. TAKAGI (Sci. Rep. Tôhoku, 1937, 26, 55–64; cf. this vol., 173).—With rising temp., the magnetisation in these metals due to the discontinuous process decreases almost linearly, the effect being greatest in strong fields, whilst the prominent discontinuous jumps in strained wires are displaced, generally, but not always, towards weaker fields. This is attributed to the splitting of the coherent magnetisable groups into smaller groups as a result of thermal motion. J. W. S.

Optical constants of sodium. H. E. IVES and H. B. BRIGGS (J. Opt. Soc. Amer., 1937, 27, 181–185).—Using the method recently reported for K (cf. this vol., 285), vals. of n and extinction coeffs. were obtained for the range 5780–2536 Å. Results, with reflecting power, principal incidence angle, and principal azimuth, are plotted as a function of λ and are compared with available data and calc. vals. N. M. B.

Tetragonal enantiomorphous nickel sulphate hexahydrate. L. BORCHJIS (Natuurwetensch. Tijds., 1937, 19, 115–148).—Tetragonal $NiSO_4 \cdot 6H_2O$ crystals grown at 38 – 40° have mean $[\alpha]_D$ $1.55^\circ/\text{mm.}$; 40% are lævo- and 60% dextro-rotatory but only dextro-crystals are formed when grown in lævo-polarised light filtered through Wood's glass. The dispersion curve has been measured between 3342 and 6442.5 Å.; an inversion occurs at λ 5060 Å. X-Ray examination by the powder method gave a 6.776 ± 0.003 , c 18.249 ± 0.009 Å., and d 2.074. A rapid method for the identification of the enantiomorphs based on etching the crystal with MeOH is described. $NiSeO_4 \cdot 6H_2O$ has mean $[\alpha]_D$ $2.35^\circ/\text{mm.}$ The results of the investigation support the germ theory of crystallisation. S. C.

Strain double refraction due to small crystal deformations. Y. KIDANI and A. SMEKAL (Physica, 1937, 4, 606–608).—The production of double refraction in NaCl crystals by small applied strains is described. O. D. S.

Artificial slip formation in crystals. A. W. STEFANOW (Nature, 1937, 140, 64).—Photographs, taken in polarised light, of slip-formation in crystals of rock-salt the surfaces of which had been scratched

and then stretched show that the scratches are the source of the slips; these, in turn, increase the surface defect, which ends in fracture. L. S. T.

Compressibility of fused-quartz glass at atmospheric pressure. W. B. EMERSON (J. Res. Nat. Bur. Stand., 1937, 18, 683—711).—The coeffs. of linear compressibility at atm. pressure and temp for fused SiO_2 and stainless steel (14% Cr) are 9.9×10^{-7} $\pm 5 \times 10^{-8}$ and 3.1×10^{-7} per atm., respectively. J. W. S.

Flow phenomena in heavily stressed metals. P. W. BRIDGMAN (J. Appl. Physics, 1937, 8, 328—336; cf. A., 1936, 146).—A review. H. J. E.

Precision extensometer measurements on tin. B. CHALMERS (J. Inst. Met., 1937, 61, Advance copy, 293—308).—Creep experiments have been made on Sn specimens consisting of (a) single crystals, (b) a few crystals with longitudinal crystal boundaries, and (c) small crystals, using an extensometer measuring by means of optical interference fringes to strains of 10^{-7} cm. per cm. The results show that the change of orientation across a crystal boundary affects the mechanical properties of the boundary and the relation between recovery and creep. The shapes of the various creep curves obtained are discussed theoretically. A. R. P.

Visual demonstration of the transformations of condensed hydrogen sulphide, H_2S and D_2S . A. KRUIS and K. CLUSIUS (Physikal. Z., 1937, 38, 510—514).—The transformations of solid H_2S may satisfactorily be explained by the existence of hindered rotation of mols. in the lattice. At least one of the two transition points should be due to a transition of the first kind. This has been verified by observing the transition from the optically anisotropic to the isotropic form by polarised light. At low temp. H_2S exists in the optically anisotropic phase III. It changes by a transformation of the first kind into optically isotropic phase II at 103.5° abs. This is confirmed by the large amount of energy (362.1 g.-cal. for H_2S) required for the change, which is used partly to increase the potential energy of the lattice, and partly to overcome the potential barrier for the hindered rotation. At 126.2° abs. phase II changes to phase I, in which the lattice is more widely spaced. No optical evidence of a change in the form of the lattice could be obtained for this transition. A. J. M.

Visual determination of the transformations of condensed hydrogen sulphide, H_2S and D_2S . E. JUSTI and H. NITKA (Physikal. Z., 1937, 38, 514).—The crystal structure of the three phases of H_2S is considered. Debye-Scherrer diagrams have shown that all three are cubic, although in the transformation phase III \rightarrow phase II there may be a slight deformation of the cubic lattice (see preceding abstract). A. J. M.

Transformation of heavy ammonium chloride. J. WEIGLE and H. SAÏNI (Arch. Sci. phys. nat., 1937, [v], 19, Suppl., 28—29).—The change in lattice dimension of ND_4Cl , corresponding with that of NH_4Cl at -30° , takes place at -22.5° , and was investigated by X-rays. At temp. $< -30^\circ$ the ND_4Cl lattice is 0.004 \AA. $>$ that of NH_4Cl . The

lattice symmetry is unaffected. The change of sp. heat with the transformation is discussed.

N. M. B.

Transformation of solid ammonium iodide between -58° and -40° . A. SMITS and G. J. MULLER (Z. physikal. Chem., 1937, B, 36, 140—145).—The transformation from the tetragonal form stable at lower temp. to the regular form is continuous and free from hysteresis. From -49° the vol. falls with rising temp. and passes through a min. at -40° . R. C.

Polymorphism of chalkone. R. J. W. LE FEVRE (J.C.S., 1937, 1037).—A sample with m.p. 30° was obtained by seeding a melt with a minute crystal of CH_2Bz_2 , and its polarisation in C_6H_6 solutions compared at 25° with that of the normal form, m.p. 58° . Results indicate that the two forms are polymorphs and not geometrical isomerides. N. M. B.

Theory of phase transformations. II. L. LANDAU (Physikal. Z. Sovietunion, 1937, 11, 545—555; cf. this vol., 363).—It is shown that the density function, ρ , of a crystal must always involve three co-ordinates. The transition from liquid to crystal is considered. The nature of liquid crystals is discussed from the viewpoint of the density function.

A. J. M.

Decrease in the electrical resistance of gold with a magnetic field at low temperatures. W. F. GIAUQUE, J. W. STOUT, and C. W. CLARK (Physical Rev., 1937, [ii], 51, 1108).—The resistance of a Au wire containing 0.1% of Ag at liquid He temp. was measured in a magnetic field of 1600—8500 gauss. At 4.23° abs. the resistance increased with field; at 1.63° abs. it decreased by $>1\%$ under 8000 gauss. N. M. B.

Second-order electrical effects in metals. A. H. WILSON (Proc. Camb. Phil. Soc., 1937, 33, 371—379).—Theoretical. Expressions for thermal conductivity and thermoelectric forces at high and low temp. are derived. F. J. L.

Anomalous change by heat-treatment of the electrical conductivity of thin films of potassium chloride and sulphur. H. SAEGUSA and T. MATSUMOTO (Sci. Rep. Tohoku, 1937, 26, 159—166; cf. this vol., 395).—The variation of conductivity (κ) with temp. for freshly evaporated films of KCl about 1μ thick follows approx. the law $\log \kappa = B - A/T$. After heating κ satisfies this equation very well, but its magnitude decreases with increasing temp. of heating, treatment at 180° reducing the val. of κ to 0.01 of the val. for the fresh film. This change is attributed to recrystallisation. The films obey Ohm's law over the range 0—50 volts. Thin S films show no great change in κ after heating. This is in accord with X-ray data which show that the S film comprises grains of a large single crystal and does not recrystallise on heating, whilst KCl shows Debye-Scherrer rings. J. W. S.

Anisotropy of heat-conductivity and thermoelectric force in metals (tungsten) in transverse magnetic fields at 20° abs. E. GRUNEISEN and H. ADENSTEDT (Ann. Physik, 1937, [v], 29, 597—604).—The thermal conductivity of crystals of W in a transverse magnetic field of 6100 oersted at 21.8°

abs. falls to 0.25 of its val. in the absence of a field. Extrapolation of results indicates that the thermal conductivity approaches a limiting val. in stronger fields. Rotation of the field vector of 6100 oersted in a plane perpendicular to a rod of W causes variations of 25% in the thermal conductivity although W crystallises regularly. Results are analogous to those for electrical conductivity. The thermo-electric contact potential of W is independent of the direction of the field and varies from 1.01 to 2.2 μ v. per degree in fields of 6100 oersted. H. C. G.

Equilibrium curve and entropy difference between the superconductive and the normal state in lead, mercury, tin, tantalum, and niobium. J. G. DAUNT and K. MENDELSSOHN (Proc. Roy. Soc., 1937, A, 160, 127—136).—The magnetic threshold curve showing equilibrium between superconductive and normal states has been determined between 1.5° and 4.5° abs. The entropy difference between the two states is calc. It is concluded that (1) the electronic entropies of non-superconductive Pb and Hg are > those calc. from Sommerfeld's formula; (2) in Ta and Nb not only valency but also electrons in the partly filled lower shell take part in the formation of the superconducting state. The difference in sp. heat is calc. for Hg and Ta. G. D. P.

Superconductors of small dimensions. R. B. PONTIUS (Nature, 1937, 139, 1065—1066).—The dependence of the threshold val. of superconductivity on diameter is represented graphically for Pb wires (99.999% Pb) at 4.21° abs. A change in threshold val. first appears at a diameter of 14.2 μ . These vals. then increase with decreasing diameter of the wire, and at 5.6 μ diameter the threshold val. is > the normal by 4.08%, indicating a depth of penetration of 10^{-5} to 10^{-6} cm. for the magnetic field. L. S. T.

Gradual penetration of a magnetic field into a superconductive sphere. W. J. DE HAAS, (Miss) A. D. ENGELKES, and O. A. GUINAU (Physica, 1937, 4, 595—600; cf. A., 1936, 929; Mendelssohn and Pontius, *ibid.*, 1056). O. D. S.

Thermomagnetic study of the complexes. [Ag.Cd₇.4C₂H₃N]S₂O₈. N. PERRAKIS and L. CAPATOS (Compt. rend., 1937, 204, 1799—1802; cf. A., 1936, 786).—The Curie points, Curie consts., and magnetic moments of the Ag^{II} ion (p_w) are tabulated for vals. of x between 0 and 1. As x increases, p_w decreases from a high val., and becomes approx. const. at $x = 0.24$ —0.27. A. J. E. W.

Gerlach's thermomagnetic electromotive force in nickel, iron, and nickel-iron alloys. N. YAMANAKA (Sci. Rep. Tohoku, 1937, 26, 40—47; cf. A., 1936, 1328).—The effects of variations in composition, applied magnetic field (H), temp. gradient, and pre-treatment of the metal on the Gerlach e.m.f. in Ni, Fe, and Ni-Fe alloys have been investigated. For annealed wires the e.m.f. is a max. for Ni and min. for alloy containing 35% of Ni. In cold-drawn wires the max. e.m.f. is > for annealed wires when the [Ni] is >87.5%, and < for annealed wires when the [Ni] is <87.5%. The val. of H for saturation e.m.f. is also > for annealed wires. J. W. S.

Effects of stress on Gerlach's electromotive force in nickel, iron, and nickel-iron alloys. N. YAMANAKA (Sci. Rep. Tohoku, 1937, 26, 48—54; cf. preceding abstract).—For Ni and Ni-Fe alloy (87.5% Ni) the saturation val. of the e.m.f. and the H at which this is attained increase with increasing tension. For alloys containing <87.5% of Ni the e.m.f. generated decreases with increasing tension. For Fe the application of tension decreases both the positive max. val. of the e.m.f. and the val. of H at which it is attained. Torsion decreases the e.m.f. for Fe and Ni. J. W. S.

Rankine magnetic balance and the magnetic susceptibility of H₂O, HDO, and D₂O. H. P. ISKENDERIAN (Physical Rev., 1937, [ii], 51, 1092—1096; cf. Rankine, A., 1934, 719).—The construction of an instrument of full theoretical sensitivity is described. Vol. magnetic susceptibilities for mixtures were measured, and, assuming the mass susceptibility of H₂O to be -0.7200×10^{-6} , the vals. deduced for HDO and D₂O are -0.6807×10^{-6} and -0.6466×10^{-6} , respectively. N. M. B.

Diamagnetic susceptibilities of salts forming ions with inert gas configurations. III. Alkaline-earth halides and general discussion. F. E. HOARE and G. W. BRINDLEY (Proc. Roy. Soc., 1937, A, 159, 395—409; cf. A., 1936, 278).—The susceptibilities of the halides of Mg, Ca, Sr, and Ba (excepting MgBr₂ and MgI₂) are determined. An attempt is made to estimate the ionic susceptibility by considering the salts in two classes with co-ordination nos. (i) 6 and 3 and (ii) 8 and 4. It is concluded that for most ions the susceptibility is less in the cryst. than in the free state, but that this is more marked for negative than for positive ions. For the former the susceptibility decreases as the co-ordination no. increases, and as the charge of the surrounding ions increases. G. D. P.

Diamagnetism of organic sulphur compounds. A. CLOW and J. M. C. THOMPSON (Trans. Faraday Soc., 1937, 33, 894—904).—The diamagnetic susceptibilities of 19 thio-compounds have been measured, and the bond depressions calc. for the linkings H·S, C·S, C→S, S→S, C≡S, and C≡S. Problems bearing on the structure of several types of thio-compounds are discussed. C. R. H.

Temperature variation of magnetic anisotropy of organic crystals. P. NILAKANTAN (Nature, 1937, 140, 29—30).—A curve showing the variation of the magnetic anisotropy of a crystal of resorcinol from 26° to the m.p. is given. The vals. given for χ_a , χ_b , and χ_c at room temp. are -66.2 , -74.3 , and $-61.0 (\times 10^{-6})$, respectively, with α 55.9°, β 47.0°, and γ 62.1°. L. S. T.

Magnetism and polymerisation. II. Oxymethylene diacetates and polyoxymethylenes. J. FARQUHARSON (Trans. Faraday Soc., 1937, 33, 824—827; cf. A., 1936, 277).—Data for the magnetic susceptibilities of polyhydric alcohols and oxymethylene diacetates have been obtained with a view of determining the vals. for the ·CH(OH)· and ·CH₂·O· groups, which, according to Pascal's rule, should be identical. The val. for the former group agrees with

Pascal's val., but the val. for the latter is \ll Pascal's val. The data also lead to the conclusion the α - and β -polyoxymethylenes are dihydrates with 32 and 44 $\cdot\text{CH}_2\cdot\text{O}\cdot$ groups and mol. wts. 978 and 1338, respectively; γ - and δ -polyoxymethylenes do not appear to be composed of $\cdot\text{CH}_2\cdot\text{O}\cdot$ groups. C. R. H.

Magnetic inhibition of susceptibilities at radio frequencies. C. J. GORTER and F. BRONS (*Physica*, 1937, 4, 579—584).—The paramagnetic susceptibility of $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ and of $\text{KCr}(\text{SO}_4)_2$ at frequencies between 1.48×10^8 and 2.32×10^8 is decreased by the application of a const. magnetic field in the direction of the alternating field. At liquid N_2 temp., saturation is reached at high fields (3000 oersted). At higher temp. the effect decreases and is negligible at 150° abs. No effect of const. field is observed with liquid O_2 or with V NH_4 alum. O. D. S.

Paramagnetic rotatory power of hydrated praesodymium ethyl sulphate in the direction of the optic axis. J. BECQUEREL, W. J. DE HAAS, and J. VAN DEN HANDEL (*Physica*, 1937, 4, 543—558; cf. this vol., 351).—The rotatory power of $\text{Pr}(\text{SO}_4\text{Et})_3 \cdot 9\text{H}_2\text{O}$ has been measured at temp. from 1.4° to 291° abs. From 1.4° to 4.2° abs. the variation of rotatory power with temp. and with magnetic field follows a similar law to that observed for the Et sulphates of Dy and Er (*loc. cit.*). A large part of the paramagnetism of Pr^{+++} is independent of temp. Results indicate that the fundamental level of Pr^{+++} in the Et sulphate is doubly degenerate. The magnetic moment in the direction of the optic axis is calc. The effective moment increases with temp., giving evidence of successive occupation of several energy levels. From the variation with temp. at very low temp., it is calc. that the separation of the two lowest energy levels of Pr^{+++} is between 20 and 30 cm^{-1} . The results of Gorter, de Haas, and van den Handel for the thermomagnetic properties of $\text{Pr}_2(\text{SO}_4)_3$ and $\text{Pr}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ (Comm. Onnes Lab., No. 218b, 218c) are discussed. O. D. S.

Ferromagnetic properties of some paramagnetic salts. L. V. SCHUBNIKOV and S. S. SCHALIT (*Physikal. Z. Sovietunion*, 1937, 11, 566—570).—The variation of the susceptibility of FeCl_2 , CoCl_2 , NiCl_2 , and CrCl_3 has been investigated over the range 14 — 80° abs. The paramagnetic Curie point of CoCl_2 and CrCl_3 found by extrapolation has no special physical significance. Ferromagnetic properties occur at temp. agreeing well with the onset of anomalies in sp. heat. A. J. M.

Anomalous specific heat of deutero-ammonium chloride, ND_4Cl , in the crystalline state. I. NITTA and K. SUENAGA (*Sci. Papers Inst. Phys. Chem. Res. Tokyo*, 1937, 32, 83—86).—Measurements with an improved Nernst type vac. calorimeter in the range -170° to 50° give a curve showing a transition temp. at approx. -24° , supporting the results of Smits (cf. this vol., 352). The temp. range of excessive sp. heat is somewhat wider than in the case of NH_4Cl . Explanations are briefly discussed. N. M. B.

Electron activation in crystals: heat capacities of $\text{Sm}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ and $\text{Nd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ from

3° to 40° abs. J. E. AHLBERG, E. R. BLANCHARD, and W. O. LUNDBERG (*J. Chem. Physics*, 1937, 5, 552—556; cf. A., 1935, 574).—Data are recorded and the electronic heat capacity of Nd^{+++} is calc. The separation of the levels of the ground states of the salts is $<1 \text{ cm}^{-1}$. An electronic energy level exists in $\text{Nd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ at 77 cm^{-1} and of double the statistical wt. of that of the ground state. J. W. S.

Ethylene. Heat capacity from 15° abs. to the b.p. Heats of fusion and vaporisation. Vapour pressure of the liquid. Entropy from thermal measurements compared with the entropy from spectroscopic data. C. J. EGAN and J. D. KEMP (*J. Amer. Chem. Soc.*, 1937, 59, 1264—1268).—Heat capacities have been determined from 15° abs. to the b.p.; the sharp rise in the curve just below the m.p. is not due to pre-melting. C_2H_4 has m.p. $103.95 \pm 0.05^\circ$ abs., b.p. $169.40 \pm 0.05^\circ$ abs., heat of fusion $800.8 \pm 0.8 \text{ g.-cal. per mol.}$, heat of vaporisation $3237 \pm 3 \text{ g.-cal. per mol.}$, v.p. of liquid (123 — 170° abs.) $\log_{10} P(\text{int. cm.}) = -(962.794/T) + 9.80431 - 0.0184522T + 0.000030870T^2$, calc. entropy at 1 atm. and b.p. $47.36 \text{ g.-cal. per degree per mol.}$ The agreement of entropy vals. calc. from calorimetric and spectroscopic data, respectively, is discussed. E. S. H.

Heat capacities of benzene, methyl alcohol, and glycerol at very low temperatures. J. E. AHLBERG, E. R. BLANCHARD, and W. O. LUNDBERG (*J. Chem. Physics*, 1937, 5, 539—551).—A low-temp. vac. calorimeter is described; it is cooled internally from 13° to 2° abs. by adiabatically expanding cooled He gas from a pressure cylinder in the calorimeter. The heat capacities of cryst. C_6H_6 and MeOH and of cryst. and glassy glycerol have been measured at 3 — 90° abs., and the entropies at various temp. calc. Below 9° abs. the heat capacity of glassy glycerol is double that of the cryst. form. The glassy form appears to have 4.64 units of entropy at 0° abs. J. W. S.

Properties of paraffins. II. A. H. W. ATEN, jun. (*J. Chem. Physics*, 1937, 5, 598; cf. this vol., 294).—Corrections. J. W. S.

Vibrational spectrum of a three-dimensional lattice. M. BLACKMAN (*Proc. Roy. Soc.*, 1937, A, 159, 416—431).—The vibrational spectrum of a simple cubic lattice is calc. and the results are applied to a discussion of the type of sp. heat curve to be expected. The applicability of the conclusions to actual crystals is considered. G. D. P.

Liquid state. W. ALTAR (*J. Chem. Physics*, 1937, 5, 577—586).—A theory of holes in liquids is developed to explain their thermal and mechanical properties. It is assumed that the thermal motion of the liquid is determined by the motion of its "surface," the latter including internal boundaries of which the liquid forms as many as its no. of degrees of freedom permit. An equation of state is derived which accords with experimental data for A. J. W. S.

Partition function for liquid mercury. J. F. KINCAID and H. EYRING (*J. Chem. Physics*, 1937, 5, 587—596; cf. this vol., 125, 224).—Assuming that

the nuclei move independently of their valency electrons, a partition function is derived from which the v.p., equation of state, entropy of melting, and sp. heat of Hg can be calc. between the m.p. and b.p. The results accord well with experiment. J. W. S.

Second virial coefficient of the different modifications of light and heavy hydrogen. I. Experimental determination. K. SCHÄFER (Z. physikal. Chem., 1937, B, 36, 85—104; cf. A., 1936, 1185).—Normal and *p*-H₂ have the same second virial coeff. and the same is true of normal and *p*-D₂. The coeffs. of CO₂ and C₂H₂ have been determined at 204—273° and 226—273° abs., respectively. R. C.

Connexion between the second virial coefficient and the phases of collision theory. L. GROPPER (Physical Rev., 1937, [ii], 51, 1108; cf. this vol., 71).—Mathematical. An expression for the low-temp. region is proposed. N. M. B.

(A) Series evaluation of isotherm data of carbon dioxide between 0° and 150° and up to 3000 atm. A. MICHELS and C. MICHELS. (B) Isotherms of carbon dioxide in the neighbourhood of the critical point and round the coexistence line. A. MICHELS, B. BLAISSE, and C. MICHELS. (C) Thermodynamic properties of carbon dioxide up to 3000 atmospheres between 25° and 150°. A. MICHELS, A. BIJL, and C. MICHELS (Proc. Roy. Soc., 1937, A, 160, 348—357, 358—375, 376—384).—(A) Isotherm data cannot be represented by a series of powers of the density (*d*) of the type $pv = A + Bd + Cd^2 + \dots$ Series representation can, however, be used for interpolation and vals. of the coeffs., *A*, *B*, etc., are tabulated for different temperatures.

(B) A new method of measuring isotherms is described. V.p. curve, crit. data, and latent heat are given. The results confirm the real existence of a crit. point.

(C) Vals. of the sp. heat at const. vol., free energy, total energy, and entropy are tabulated. G. D. P.

Expansion and pressure coefficients of nitrogen, hydrogen, helium, and neon, and the absolute temperature of 0° C. M. KINOSHITA and J. OISHI (Phil. Mag., 1937, [vii], 24, 52—62).—Measurements made with a gas thermometer, which is described, are recorded. N₂, H₂, and He give 0° = 273.167 ± 0.005° abs. Ne gives inconsistent vals. A. J. E. W.

Vapour pressures of saturated gaseous hydrocarbons at low temperatures in presence of silica gel. R. DELAPLACE (Compt. rend., 1937, 204, 1940—1941; cf. this vol., 231).—V.p. of CH₄, C₂H₆, C₃H₈, *n*- and *iso*-C₄H₁₀ in presence of SiO₂ gel at -171° to -25° are tabulated. A method of quant. separation of CH₄ from C₂H₆, C₂H₆ from C₃H₈, and C₃H₈ from C₄H₁₀ is indicated. J. G. A. G.

Vapour pressure of copper and iron. A. L. MARSHALL, R. W. DORNT, and F. J. NORTON (J. Amer. Chem. Soc., 1937, 59, 1161—1166).—The v.p. of Fe at 1317—1579° abs. and Cu at 1268—1466° abs. have been determined from the rates of vaporisation. The emissivities have been determined directly; for Fe and Cu the vals. of ΔE_0° are 96,033 and 81,240 g.-cal. per g.-atom, respectively. E. S. H.

Nature of calomel vapour. F. T. GUCKER, jun., and R. H. MUNCH (J. Amer. Chem. Soc., 1937, 59, 1275—1279).—Study of the absorption of the resonance line at 2537 Å. shows the presence of Hg in HgCl vapour (undried) at 100—450°. The partial pressures indicate that $2\text{HgCl} = \text{Hg} + \text{HgCl}_2$ is complete. In the vapour of dried HgCl, Hg is observed at 250—400°, but not at <250°; the dried vapour also exhibits general absorption in the ultra-violet, which is not shown by the undried vapour. The v.d. of the dried vapour at 375—425° corresponds with HgCl mols.; no evidence of Hg₂Cl₂ mols. was obtained. E. S. H.

Variations in the mechanochemical constants of benzene hydrocarbons along the vaporisation curve from the origin to 74.5 cm. of Hg. G. DUCH (Compt. rend., 1937, 204, 1807—1809).—The mechanochemical const. *n* and *K*⁻³ (cf. A., 1936, 1052) are linear functions of the v.p. A method of calculating the mol. wt. from *d* and *γ* is deduced. A. J. E. W.

Experimental verification of Thomson's formula. K. S. LJALIKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 327—330).—Thomson's equation, connecting curvature of a surface and the v.p., has been verified by determining the variation of the velocity of evaporation of small drops of Hg with their radius. A. J. M.

Vapour pressure and size of particles. D. BALAREV [with N. KOLAROV] (Monatsh., 1937, 70, 318—323).—The effect of grinding on the v.p. of NaCl and KBr has been investigated. The curve of v.p. against average size of particles has a min. at 3—4 μ. F. J. G.

Heat conduction in liquid helium. J. F. ALLEN, R. PETERLS, and M. Z. UDDIN (Nature, 1937, 140, 62—63).—The heat-conductivity of liquid He II, measured at 1.34 and 2.06° abs. by a new method, depends on the temp. gradient, an unusual effect that appears to be a property of the liquid He II. L. S. T.

Physical identity of enantiomers. III. Viscosities, densities, and refractivities of *d*-, *l*-, and *dl*-forms of oximinocamphor (stable and unstable), camphor, camphoric acid, camphoric anhydride, camphorquinone, and sodium camphorate. B. K. SINGH, K. NARAYAN, P. SINHA, H. PRASAD, and N. CHATTERJI (Proc. Indian Acad. Sci., 1937, 5, A, 484—498).—The *d* and refractivities of *d*-, *l*-, and *r*-forms are identical in every case. The viscosity-concn. curves of *d*- and *l*-forms are identical with that of the racemate below a certain concn., indicating that the racemate is dissociated into *d*- and *l*-forms; above this concn. the racemate exists in solution and its viscosity is > that of *d*- and *l*-forms. F. J. L.

Viscosity-temperature relations. M. SOUDERS, jun. (J. Amer. Chem. Soc., 1937, 59, 1252—1254).—The relation $\log_{10}(\eta/d) - A/T - B$ agrees with the data for 47 org. liquids with errors generally < 1%. The const. *A* and *B* and the errors at various temp. for each liquid are reported. The error increases with rise in mol. wt. rather than with increase of *η*.

The equation cannot be applied satisfactorily to substances of high mol. wt., such as petroleum oils, except over short ranges of temp. E. S. H.

Temperature, pressure, and volume coefficients of the viscosity of fluids. R. H. EWELL (J. Chem. Physics, 1937, 5, 571—576).— $(\delta\eta/\delta T)_p$ and $(\delta\eta/\delta T)_v$, both positive for dilute gases and negative for ordinary liquids, become zero at intermediate states, but for the former at lower densities than for the latter. The signs of the η - p and η - V coeffs. are deduced for various states of the η - T coeffs. It is shown that for changes in $V > 10\%$, $(\delta\eta/\delta V)_T$ is const. (ϕ = fluidity), a relation analogous to that of Batchinski, $(\delta\phi/\delta V)_p$ = const. J. W. S.

Viscosity (or fluidity) of liquid or plastic uni-molecular films. R. J. MYERS and W. D. HARKINS (J. Chem. Physics, 1937, 5, 601—603).—The viscosities (η) of unimol. films of fatty acids have been determined by measuring the quantity (Q) of film flowing through a slit (of diameter d and length l) in a metal barrier across a trough, under its own pressure (f). $C_{18}H_{37}CO_2H$ films show a non-linear relation between Q and f , indicating that the film is a plastic solid, but for the other acids $Q \propto f$ and η is given by $fd^3/12lQ$. There is some evidence of an increase of η with rise of temp. J. W. S.

Measurement of the diffusion of metal atoms in gases at room temperature by an optical method. E. F. M. VAN DER HELD and M. MIESOWICZ (Physica, 1937, 4, 559—578).—The distribution of Na atoms diffusing against a stream of N_2 at room temp. and about 1 mm. pressure has been determined from measurements of the intensity distribution of Na light emitted on excitation of the vapour by a condensed discharge. The diffusion coeff. at 15° and 1 mm. pressure is 20.4 sq. cm. per sec. Results are compared with those of Ginsel (A., 1933, 991) at flame temp. The const. θ in the factor of Reinganum, $\exp. \theta/\tau$, is found to be 600 and the collision radius of Na 1.84 Å. When excitation was produced by an induction discharge a homogeneous bimol. reaction, $Na + N + (N_2) = NaN + (N_2)^*$, was observed. O. D. S.

Viscosity of binary mixtures. J. S. GOURLAY (Nature, 1937, 140, 157).—A crit. discussion of Lederer's equation (this vol., 126). L. S. T.

Metallic state and intermetallic compounds. J. S. ANDERSON (Chem. and Ind., 1937, 677—681).—A review. J. S. A.

Alloys of magnesium. VI. Constitution of magnesium-rich alloys of magnesium and calcium. J. L. HAUGHTON (J. Inst. Met., 1937, 61, Advance copy, 325—331).—Alloys of Mg with $>26.7\%$ Ca form a simple eutectiferous series, the Mg-Mg₂Ca₃ eutectic occurring at 16.2% Ca, $517^\circ \pm 1^\circ$. Mg dissolves 1.8% Ca at 517° and about 0.5% at 250° . A. R. P.

New intermediate phase in the aluminium-copper system. A. G. DOWSON (J. Inst. Met., 1937, 61, Advance copy, 317—324).—In Cu alloys with 14—17% Al a stable phase exists above 963° ; at this temp. it decomposes into $\beta + \gamma$ eutectoid, the eutectoid composition being 15.4% Al. An alloy of

15.9% Al corresponds with Cu_3Al_4 which should have a γ -structure with 52 atoms per unit cell; this could not be confirmed since the phase cannot be retained by quenching, but its range of existence has been delineated by thermal and dilatometric analysis. A. R. P.

Constitution of the nickel-aluminium system. W. O. ALEXANDER and N. B. VAUGHAN (J. Inst. Met., 1937, 61, Advance copy, 333—346).—The system has been examined by thermal analysis and micrography. The solubility of Al in Ni decreases from 11% at 1385° to 6% at 980° and 5% at 700° . There is a eutectic at 86.7% Ni, 1385° between α and δ ; the liquidus then rises steeply to 1638° at 68.5% Ni (NiAl) and then with more Al the solidus falls steeply to 1133° , 61% Ni where NiAl solid solution reacts with liquid containing 44.4% Ni to produce a new phase with 59.5% Ni (Ni_2Al_3). A second peritectic reaction occurs at 854° in which Ni_2Al_3 solid solution containing 55% Ni reacts with liquid containing 28.4% Ni to give NiAl₃. Finally the Al-NiAl₃ eutectic occurs at 539° , 5.7% Ni. The δ -phase has a face-centred cubic structure with superlattice; it forms a limited series of solid solutions, the boundary line on the Al side sloping uniformly from 86% Ni at 1395° to 84.5% Ni at 980° and thereafter becoming vertical, and on the Ni side being vertical at 86.7% Ni below 1360° . The boundary of the NiAl solid solution on the Ni side is at 83, 80.6, and 79.2% Ni at 1395° , 1150° , and 900° , respectively, and on the Al side at 61 and 64.2% Ni at 1133° and 850° , respectively. The Ni_2Al_3 phase extends from 56 to 60% Ni from 1133° on the Ni side and from 854° on the Al side down to room temp. NiAl₃ does not appear to dissolve either Ni or Al. A. R. P.

X-Ray study of the chromium-aluminium equilibrium diagram. A. J. BRADLEY (J. Inst. Met., 1937, 60, Advance copy, 197—215).—From X-ray examination of powdered Al-Cr alloys slowly cooled from 800° the existence of 9 phases has been established; two other phases occur in alloys quenched from $>1000^\circ$. The α solid solution of Al in Cr (body-centred cubic) extends to 28% Al at 900° , 18% Al at 830° , and somewhat less at 20° . At 850° alloys with 25—19% Al are converted into a tetragonal (ordered) β -phase formed of three body-centred cubes stacked one above the other. There are four phases with a γ -brass structure: γ_1 decomp. at 1000° into $\alpha + \delta$ (40% Al), γ_2 (Cr_5Al_3) formed from $\alpha + \delta$ at 890° , γ_3 (51% Al) also formed from $\alpha + \delta$ at about 870° , and γ_4 (52—65% Al) formed at about 700° from $\gamma_3 + \epsilon$. It is suggested the γ_3 and γ_4 are modifications of Cr_4Al_3 . The δ -phase ($CrAl_3$) is stable only above 860° and is always associated, in quenched alloys, with the products of its decomp. The ϵ -, η -, and θ -phases have only small ranges of homogeneity at $<600^\circ$ and appear to be the compounds $CrAl_4$, Cr_2Al_{11} , and $CrAl_7$, respectively; their structures are very complicated although single crystals of θ have been isolated having an orthorhombic (pseudo-hexagonal) structure, a 19.99, b 34.51, c 12.47 Å. A. R. P.

Decomposition of gold-nickel single crystals. W. KOSTER and A. SCHNEIDER (Z. Metallk., 1937, 29,

103—104).—The decomp. of Au-Ni single crystals into Au-rich and Ni-rich solid solutions takes place in a similar way to that of polycryst. aggregates, the lattice const. changing only slightly, but measurably.

A. R. P.

Accurate determination of the f.p. of alloys and a study of valency effects in certain alloys of silver. W. HUME-ROTHERY and P. W. REYNOLDS (Proc. Roy. Soc., 1937, A, **160**, 282—303).—A method for determining the f.p. of alloys which is stated to have an accuracy of $\pm 0.1^\circ$ to $\pm 0.3^\circ$ is described. Ag-rich alloys of Ag-Cd, Ag-In, Ag-Sn, and Ag-Sb have been investigated. The initial depressions of f.p. of Ag produced by 1 at.-% of the solutes are not \propto the nos. 2, 3, 4, and 5 but to factors 2*a*, 3*a*, 4*b*, and 5*b* where *b* is slightly < *a*.

G. D. P.

Solidification diagram and thermal conductivity of rubidium-cæsium alloys. É. RINCK (Compt. rend., 1937, **205**, 135—137; cf. A., 1936, 1193).—Rb and Cs form a complete series of solid solutions; the solidus and liquidus have minima at 9° , with Rb:Cs = 1. The conductivity affords no evidence of compound formation.

A. J. E. W.

Optical constants of alloys of the copper-zinc system. H. LOWERY, H. WILKINSON, and D. L. SMARE (Proc. Physical Soc., 1937, **49**, 345—353).—Measurements over the range 4358—6000 Å. have been made of *n*, absorption and reflexion coeffs. with polished specimens of a series of Cu-Zn alloys covering the α , β , and γ modifications of brass. The data are discussed in reference to the degree of polish of the metal surface.

C. R. H.

Theoretical interpretation of the optical constants of copper-zinc alloys. N. F. MOTT (Proc. Physical Soc., 1937, **49**, 354—356).—The data of Lowery *et al.* (cf. preceding abstract) are discussed in relation to the electron theory of metals. Explanations are offered for the increase of absorption on the long- λ side of the absorption edge, and for the shift of the absorption edge, which becomes less sharp, towards the shorter λ when Zn is added to Cu. Theoretical vals. for the shift of the absorption edge are calc. for certain alloys.

C. R. H.

Heat of formation of intermetallic compounds. W. BILTZ (Z. Metallk., 1937, **29**, 73—79).—A review of recent work and a discussion of the relation between intermetallic compounds based on the theory of chemical affinity.

A. R. P.

Heat of formation of some metallic systems calculated from A. Olander's electrochemical data. F. WEIBKE (Z. Metallk., 1937, **29**, 79—84).—The vals. for the various phases in the Cd-Sb, Bi-Tl, Ag-Cd, Au-Cd, and Cu-Zn systems have been calc. and are shown in tables and graphs.

A. R. P.

Thermochemistry of alloys. I. Direct determination of heats of formation of the alloy series cobalt-silicon, iron-aluminium, cobalt-aluminium, nickel-aluminium, copper-aluminium, and antimony-zinc in the cast condition. W. OELSEN and W. MIDDEL (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1937, **19**, 1—26).—Data for

complete series of the alloys are recorded and compared with the corresponding equilibrium diagrams. The use of thermochemical data in the determination of such diagrams is discussed. Heats of formation have been determined for Co₂Si 27.6, CoSi 24.0, CoSi₂ 24.6, CoSi₃ 25.6, Fe₃Al 14.8, FeAl 12.2, FeAl₂ 19.5, FeAl₃ 26.8, Cu₂Al 16.0, CuAl 9.5, CuAl₂ 9.5, CoAl 26.4, CoAl₂ 31.8, Co₂Al₃ 70, CoAl₄ 38.5, Ni₃Al 37.6, NiAl 34.0, NiAl₂ 37.8, NiAl₃ 38, and ZnSb 3.6 kg.-cal. per g.-mol.

E. S. H.

Ordered distribution in metallic solid solutions. R. BECKER (Metallwirts., 1937, **16**, 573—578).—A review.

C. E. H.

Time of formation of martensite needles. F. FORSTER and E. SCHEIL (Naturwiss., 1937, **25**, 439—440).—The transformation of the face-centred γ -lattice of Fe into the space-centred α -lattice (formation of martensite) takes place in an Fe-Ni alloy with 29% Fe at room temp. in a series of steps which succeed each other sufficiently rapidly to give an audible note. By an electrical method making use of this fact, the time of formation of a single martensite needle is found to be 0.02 sec.

A. J. M.

The system copper-lead-nickel. W. CLAUS (Metallwirts., 1937, **16**, 578—579).—Alloys of varying composition were melted and allowed to solidify slowly, in order to establish the ranges of immiscibility in the liquid state. These ranges are somewhat more extended than in the diagram of Guertler and Menzel (B., 1923, 982A).

C. E. H.

Constitution of the alloys of silver, tin, and mercury. M. L. V. GAYLER (J. Inst. Met., 1937, **60**, Advance copy, 151—172).—Except for Sn-rich alloys with <6% Hg the entire liquidus of the system has been determined by thermal and X-ray analysis. Ternary diagrams are also plotted for the equilibria at 70° , 84° , and 100° and pseudo-binary diagrams for const. Hg contents of 4.5, 40, 50, 60, 65, 70, and 80% Hg and for 20% Sn. Addition of Sn to Ag-Hg alloys lowers the liquidus temp. progressively, raises steeply the α_1 + liquid $\rightarrow \beta_1$ reaction, and causes below 150° the separation of γ_1 or γ_2 from the β_1 + liquid phase until at 84° the invariant reaction β_1 + liquid $\rightarrow \gamma_1$ + γ_2 occurs. The γ_2 phase is unstable in the presence of liquid and a further invariant reaction occurs at 80° : γ_1 + γ_2 + liquid $\rightarrow \gamma_1$ + δ_2 . At -36° a third invariant reaction occurs: γ_1 + δ_2 + liquid $\rightarrow \gamma_1$ + ϵ_2 , and at -38.8° any excess of Hg freezes without affecting the γ , β , and ϵ_2 phases. Furthermore, since the β phases of the Ag-Sn and Ag-Hg phases are isomorphous each will hold a large proportion of the other in solid solution; this fact and the first two of the above invariant reactions account for the setting of dental amalgams. Analysis of the complex reactions occurring between Ag₃Sn and Hg affords evidence for the existence of three further invariant reactions: γ (Ag₃Sn) + α_2 + liquid $\rightarrow \gamma$ + β_2 ($>217^\circ$, $<221^\circ$), γ + β_2 + liquid $\rightarrow \gamma$ + γ_2 (217°), and γ + liquid $\rightarrow \gamma$ + γ_2 ($>210^\circ$, $<216^\circ$). [Greek letters without subscript refer to Ag-Sn phases, with subscript₁ to Ag-Hg phases, and with subscript₂ to Sn-Hg phases.]

A. R. P.

Ternary iron alloys. R. VOGEL (Metallwirts., 1937, 16, 630—632).—Recent work on the constitution of Fe-C-P, Fe-C-Co, and Fe-S-Mn alloys is reviewed. C. E. H.

New ternary compounds with a β -brass superstructure. P. RAHLES (Metallwirts., 1937, 16, 640—643).—Four new phases having the lattice of β -brass with a superstructure ($a' = 2a$) have been examined. Compositions and lattice const. at approx. the centre of their ranges of existence are: β -(Cu,Ni)₃Sn, $a' = 5.946$ Å.; β -(Cu,Ni)₃Sb, $a' = 5.857$ Å.; Ni₂MgSn, $a' = 6.097$ Å.; Ni₂MgSb, $a' = 6.050$ Å. The Sn alloys obey the Hume-Rothery rule if Ni is considered univalent, but the relations exhibited by the Sb alloys are rather doubtful. C. E. H.

Eutectic and peritectic solidification processes with one degree of freedom in ternary alloys. J. SCHRAMM and H. J. LUCKERT (Z. physikal. Chem., 1937, 179, 73—118).—Binary eutectic and peritectic reactions and the conditions determining the passage of one into the other have been examined mathematically. Applications are discussed. R. C.

Use of the centrifuge for investigating alloys. G. KOMOVSKI (Physikal. Z. Sovietunion, 1936, 10, 840—842).—The use of a centrifuge for separating intermetallic phases from the rest of the melt is described. X-Ray photographs can be taken during rotation, and indicate, in many cases, the complete separation of phases. A. J. M.

Derivation of formulæ for the absorption coefficient of readily soluble gases. I. L. PEJSACHOV (J. Chem. Ind. Russ., 1937, 14, 361—365).—Mathematical. R. T.

Solubility of hydrogen, carbon monoxide, and their mixtures in methyl alcohol under pressure. I. R. KRITSHEVSKI, N. M. SHAVORONKOV, and D. S. TZIKLIS (J. Chem. Ind. Russ., 1937, 14, 170—173).—The solubility of H₂ and of CO in MeOH rises with increasing temp. (30—140°) and pressure (50—300 atm.). Data are recorded for the composition of the liquid and vapour phases of the system H₂-CO-MeOH, at 140° between 50 and 300 atm. R. T.

Vapour pressure of ammonia, carbon dioxide, water, and formic acid over ammoniacal copper sulphate solution. E. P. LEVITZKAJA (J. Chem. Ind. Russ., 1937, 14, 342—346).—The v.p. of NH₃, CO₂, and H₂O over solutions containing NH₃, CO₃²⁻, Cu^I, Cu^{II}, and HCO₂H has been determined at 0—82°. HCO₂H is absent from the vapour phase at all temp. Evidence is presented that the reaction HCO₂H → CO + H₂ takes place at 70—80°. R. T.

Theoretical formula for solubility of hydrogen in metals. R. H. FOWLER and C. J. SMITHELLS (Proc. Roy. Soc., 1937, A, 160, 37—47).—A formula for the influence of temp. when dissolution takes place without formation of hydride is derived. Agreement with experiment for Cu, Fe, Co, and Ni is obtained. An approx. theory for the cases of Ti, V, Zr, and Th, which form hydrides, yields an expression which accords with experimental data. G. D. P.

Solubility of barium nitrate in concentrated nitric acid. C. H. GREENE (J. Amer. Chem. Soc., 1937, 59, 1186—1188).—Data are recorded for concns. of HNO₃ up to 92% at 0° and 24.88°. In the range 55—80% HNO₃ the logarithms of the solubilities are a quadratic function of the acid concn. E. S. H.

Rate of dissolution of benzoic acid in dilute aqueous alkali. C. V. KING and S. S. BRODIE (J. Amer. Chem. Soc., 1937, 59, 1375—1379).—The rate of dissolution from rotating cylinders has been measured in H₂O, aq. NaOH and KOH, with and without dissolved NaOAc, at 25°. The results are in agreement with a rate equation derived on the assumption that neutralisation occurs slowly within a diffusion layer. E. S. H.

Solubility of sodium hyposulphite (Na₂S₂O₄) in presence of sodium chloride or hydroxide, and ethyl alcohol. N. S. ARTAMONOV and S. I. SCHADRINA (J. Chem. Ind. Russ., 1937, 14, 35—37).—The solubility of Na₂S₂O₄ is depressed by NaCl, NaOH, or EtOH; a saturated solution in 20% NaCl contains 102, in 20% EtOH 98.8, and in 20% NaOH 31.1 g. of Na₂S₂O₄ per 100 ml. R. T.

Solubility of copper ions in cadmium mercuric thiocyanate. M. STRAUMANIS [with E. MANKOVIČS] (Z. anorg. Chem., 1937, 233, 201—208).—Cd[Hg(CNS)₄] is tetragonal, a 11.4406 ± 0.0005, c 4.200 ± 0.001 Å. The coloured ppts. containing Cu are true mixed crystals in which Cd ions are replaced by Cu ions up to a limiting ratio Cu : Cd = 1 : 65. The ratios Cu : Cd in solution and solid are approx. equal. There is no compound formation in the solution. The replacement of Cd by Cu in the crystals causes a slight contraction of the lattice. Cu cannot be replaced by Cd in Cu[Hg(CNS)₄]. F. J. G.

Determination of concentration of solutions by the two-solvent method. I. Concentration of water-insoluble substances. S. I. SPIRIDONOVA (J. Gen. Chem. Russ., 1937, 7, 1071—1081).—The concn. of EtOH or COMe₂ solutions of H₂O-insol. substances (camphor, borneol, C₁₀H₈) is derived from the vol. of H₂O which must be added to achieve permanent turbidity. R. T.

Solubility equation of a pure substance which forms a solid complex with the solvent. J. PERREU (Compt. rend., 1937, 205, 43—45).—The author's expression for the equilibrium of a solid hydrate and its saturated aq. solution (A., 1934, 249) has been extended generally. Solubility, v.p., and thermal data for mixtures of COMe₂ and NaI or NaI.3COMe₂ at various temp. have been successfully applied to its verification. C. R. H.

Aluminium iodide as a solvent. V. IZBEKOV and A. NISHNIK (J. Gen. Chem. Russ., 1937, 7, 1268—1279).—SnI₄, SbI₃, AsI₃, and I are miscible in all proportions with AlI₃ at 200°. Saturated solutions of HgI₂ contain 75, of NaI, KI, or NH₄I 50, and of PbI₂, NiI₂, or BiI₃ 20 mol.-%. The solubility of salts with a mol. space lattice is > that of salts with an ionic lattice. Solutions of SnI₄ are non-conducting, whilst those of AsI₃ or I are feeble, and of the remaining salts good, conductors. R. T.

Internal constitution of non-ideal solutions ; demixing and complex formation. J. TIMMERMANS (Trav. Congr. Jubil. Mendeléeu, 1937, 2, 447—452).—Various types of mixtures and complexes are described and illustrated by examples. C. R. H.

Coefficients of fractionation of salts possessing several hydrates. B. GOLDSCHMIDT (Compt. rend., 1937, 205, 41—42).—When radioactive solutions of $\text{Ba}(\text{OAc})_2$ were crystallised at various temp., the activity of the crystals was always < that of the liquors, the ratio crystal activity : liquor activity decreasing abruptly with the formation of a higher hydrate on lowering the crystallising temp.

C. R. H.

Adsorption of gases and the equation of the liquid state. E. C. C. BALY (Proc. Roy. Soc., 1937, A, 160, 465—487).—Adsorption is supposed to take place by the formation of layers. Expressions are derived for the fractions of the total surface area covered by successive unimol. layers. The Freundlich isotherm is said to have no physical significance, its form being a mathematical property of the sum of the particular type of series governing multi-layer adsorption. From the adsorption formula the equation of the liquid state is deduced, and the v.p. and latent heat of liquid CO_2 between -56.6° and -26° are accurately expressed. The heat of desorption is discussed and the fact that experimental vals. increase with decrease of pressure is taken as proof that the adsorbed state corresponds with the formation of layers of gas. The val. of the heat of desorption governs the phenomena of preferential adsorption, poisoning, and chemisorption. G. D. P.

Adsorption of neon and helium. V. G. FASTOVSKI and L. A. GIRSKAJA (J. Chem. Ind. Russ., 1937, 14, 358—361).—The adsorption of Ne and He by active C has been studied between -195.7° and 0° at 20—880 mm. R. T.

New mode of transformation. A. DEBIERNE (Compt. rend., 1937, 205, 141—143).—Very large quantities of heat (of the order of 10^8 g.-cal. per g.-mol. with H_2 or He) are evolved during the initial absorption of small quantities of H_2 , He, or Ne on previously desorbed charcoal at -195° . The phenomenon is attributed to a nuclear reaction.

A. J. E. W.

Properties of activated sugar charcoal coated with various organic substances. II. Adsorption of acids. H. K. ACHARYA (J. Indian Chem. Soc., 1937, 14, 188—196; cf. this vol., 234). The adsorption of acids by activated sugar charcoal coated with $\alpha\text{-C}_{10}\text{H}_7\text{-NH}_2$ or NHPh_2 is > by the original charcoal, reaching a max. val. at 0.005—0.010 g. of amine per g. of charcoal. Assuming the amine layer to be unimol., the surface area per g. of charcoal is 288 sq. m. Acid coverings decrease the adsorption of acids. F. J. L.

Dissociative adsorption of hydrogen by copper and its kinetic consequences. L. CLARKE (J. Amer. Chem. Soc., 1937, 59, 1389—1391).—The assumption of dissociative adsorption at a uniform surface leads to kinetic consequences which explain

the observed equilibria in the primary activated adsorption of H_2 by Cu. E. S. H.

Adsorption on measured surfaces of vitreous silica. II. W. G. PALMER (Proc. Roy. Soc., 1937, A, 160, 254—267; cf. A., 1935, 818).—Previous work at low pressures has been extended at 25° up to saturation for C_2H_6 , CO Me_2 , and MeOH . The films are 4 mols. thick at saturation and the linear relation between log adsorption potential and amount adsorbed holds over almost the whole pressure range. The spreading force is calc. from the observations by means of an equation of state for the films. The behaviour of films of small mols. on the solid is compared with that of films of long-chain mols. on H_2O . G. D. P.

Adsorption of gaseous silicon tetrafluoride and of aqueous silicofluoric acid. I. VEICHHERTZ, A. ISAKOVA, O. DRUSHININA, and P. MANUILOV (J. Chem. Ind. Russ., 1937, 14, 122—126).— H_2SiF_6 is feebly absorbed by SiO_2 gel; adsorption proceeds according to Freundlich's equation. The adsorption isotherms of SiF_4 on SiO_2 gel ($10\text{--}30^\circ$) exhibit certain anomalies, ascribed to reaction of SiF_4 with H_2O in the gel. Adsorption by active C is anomalously high, due to formation of a multimol. adsorption layer. R. T.

Exchange adsorptions on the surface of barium sulphate. I. M. KOLTHOFF and G. E. NOPONEN (J. Amer. Chem. Soc., 1937, 59, 1237—1239).—The following exchange adsorption processes have been demonstrated: $\text{BaSO}_4 + \text{Pb}^{++} \rightarrow \text{PbSO}_4 + \text{Ba}^{++}$, $\text{BaSO}_4 + \text{CrO}_4^{--} \rightarrow \text{BaCrO}_4 + \text{SO}_4^{--}$, $\text{BaSO}_4 + 2\text{IO}_3^- \rightarrow \text{Ba}(\text{IO}_3)_2 + \text{SO}_4^{--}$. A method for determining the sp. surface of BaSO_4 , based on the exchange of CrO_4^{--} and SO_4^{--} , is described. E. S. H.

Replacement of small adsorbed molecules by larger [molecules]. H. MARK (Österr. Chem.-Ztg., 1937, 40, 343—344).—The energy relations of the exchange process are discussed. E. S. H.

Base exchange in soluble Prussian-blues. F. C. GUTHRIE and J. T. NANCE (J.S.C.I., 1937, 56, 209—210T).—Base exchange is found to occur between the alkali metals and NH_4 and sol. Prussian-blue ppts. obtained by adding aq. FeCl_3 to an excess of aq. $\text{K}_4\text{Fe}(\text{CN})_6$. When the mol. ratio of the salts is 0.2, Na, NH_4 , and Rb almost completely displace the alkali already present, but displacement by Li and Cs occurs to a much smaller extent. In a ppt. formed by a 7 : 6 mol. ratio of FeCl_3 to $\text{K}_4\text{Fe}(\text{CN})_6$ the displacement of K by NH_4 takes place by equivs.

Salt formation and base exchange of graphitic acid. H. THIELE (Kolloid-Z., 1937, 80, 1—20).—The prep. and purification of graphitic acid (I) are described; the conductivity of the sols. has been determined. The amount of Fe, Ag, Na, Li, K, NH_4 , Ba, or Ca taken up by (I) in aq. salt or hydroxide solutions has been determined; salts of (I), analogous to the zeolites, are formed. Base exchange has been observed. E. S. H.

Coprecipitation and ageing. XI. Adsorption of ammonio-copper ion on and coprecipitation with hydrous ferric oxide. Ageing of the precipitate. I. M. KOLTHOFF and B. MOSKOVITZ

(J. Physical Chem., 1937, 41, 629—644; cf. A., 1936, 791).—The effect of the concn. of NH_3 and of NH_4 and alkali salts in the adsorption on and copptn. with $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ has been studied. O. J. W.

Flow of gaseous mixtures through capillaries. II. Molecular flow of gaseous mixtures. III. Flow at medium pressures. H. ADZUMI (Bull. Chem. Soc. Japan, 1937, 12, 285—291, 292—303; cf. this vol., 405).—II. Rates of flow at very low pressures at which the mean free path is large compared with the capillary diameter have been investigated. Rates of mol. flow of H_2 , C_2H_2 , and C_3H_6 conform to Knudsen's equation. The rates of mol. flow of H_2 — C_2H_2 and H_2 — C_3H_6 mixtures are additive in character, and the changes in composition due to passage through capillaries conform to the additive law.

III. Data for H_2 , C_2H_2 , C_3H_6 , C_6H_6 , CCl_4 , CHCl_3 , and Et_2O , and the mixtures H_2 — C_6H_6 , H_2 — C_3H_6 , C_6H_6 — CCl_4 , CCl_4 — CHCl_3 , and Et_2O — CHCl_3 at 0.01—4 mm., at which the flow is partly viscous and partly mol., show that the rate of flow of mixtures agrees with a velocity—pressure relation similar to that for single gases, although the minima observed with the single gases are < for mixtures and occur at lower pressures. J. G. A. G.

Flow of gases through a porous wall. H. ADZUMI (Bull. Chem. Soc. Japan, 1937, 12, 304—312).—The rate of flow of a gas through a porous plate is deduced on the assumption that the plate consists of an assemblage of parallel capillaries each of which consists of series of short capillaries of various diameters. Observed rates of flow agree with the equation, and the no. and mean radius of the pores in porous plates are evaluated. J. G. A. G.

Permeability of palladium to hydrogen. VII. Influence of the state of purity of palladium on the changes produced in diffusive power by heating above 500° . Further consideration of the effect of temperature. V. LOMBARD, C. EICHNER, and M. ALBERT (Bull. Soc. chim., 1937, [v], 4, 1276—1285; cf. A., 1936, 790).—Commercial Pd containing Au, Ag, Pt, Pb, Sn, and Cu does not lose diffusive power when maintained at 500 — 670° in H_2 for long periods, and the sp. rate of diffusion of H_2 increases with rise of temp. Loss of diffusive power develops with increased purity of the Pd. J. G. A. G.

Discontinuous step-like change of vapour pressure of substances adsorbed in capillaries, and measurement of molecular diameter. D. RĂDULESCU and S. TILNCSCHI (Z. physikal. Chem., 1937, 179, 210—226).—It is shown theoretically that the radius of curvature of a liquid meniscus in a capillary is an integral multiple of the radius (ρ) of the liquid mol., so that the Helmholtz—Kelvin equation for the variation of v.p. (p) with radius of curvature becomes $\log_e p_r = \log_e p - 2\sigma M / (RT\delta n\rho)$, where n is an integer. Adsorption and desorption isotherms must, therefore, be stepped curves, but this discontinuous character will be experimentally detectable only for small vals. of n . The mean height of the steps will give the approx. mol. radius. Such curves have been obtained for the desorption of C_6H_6 and CH_2PhCl from activated C. R. C.

Movement of fluid parallel to the axis of a solid cylinder, and the Liesegang phenomenon. T. OKAYA (Japan. J. Physics, 1937, 12, 9—25).—Mathematical. E. S. H.

Dielectric properties of water. Dielectric interphases. H. FROCKE and H. J. CURTIS (J. Physical Chem., 1937, 41, 729—745).—The dielectric properties of an aq. suspension are derived from the conductivity and capacity at the interphase. Variation with frequency over the range 0.25 to 2000 kc. per sec. has been studied. F. R. G.

Theory of surface tension of aqueous solutions of dipolar ions. K. ARIYAMA (J. Chem. Physics, 1937, 5, 467—469).—A theory of surface tension of aq. solutions of NH_2 -acids, based on the idea of an "image force" at the air— H_2O boundary, is discussed and applied to experimental data on seven acids. W. R. A.

Liquid film in gas absorption. M. H. HUTCHINSON and T. K. SHERWOOD (Ind. Eng. Chem., 1937, 29, 836—840).—The coeff. of the rate of transfer of a solute across the liquid film has been studied by measurements of the rate of dissolution of eight relatively insol. pure gases in H_2O . When the H_2O is effectively stirred k_L is approx. \propto the 0.6 power of the speed of the stirrer. At a const. stirring speed k_L depends on the mol. wt. of the gas, since He and H_2 give figures some 30—35% > most of the other gases, but, on the other hand, for gases of mol. wt. from 28 to 71 shows a remarkable constancy. F. J. B.

Effect of evaporation on the stability of liquid films. H. A. NEVILLE and T. H. HAZLEHURST (J. Physical Chem., 1937, 41, 545—551).—The effect of evaporation on the stability of films of pure liquids (H_2O , EtOH, aliphatic and aromatic hydrocarbons) has been studied. Liquid films become thinner by drainage and by suction where curvature exists, and can persist only so long as flow of liquid into the thin portion counteracts drainage. This flow of liquid results from thermal effects due to evaporation of the liquid. The film becomes unstable when evaporation from it is prevented. O. J. W.

Built-up films of barium stearate and their optical properties. (Miss) K. B. BLODGETT and I. LANGMUIR (Physical Rev., 1937, [ii], 51, 964—982).—The technique of depositing successive single layers of mols. of various stearates on a solid surface is described. Films showing a series of steps of two mol. layers are photographed. From measurements of the angles at which films containing known nos. of layers reflect with min. intensity, the thickness per layer and val. of n is calc. with high accuracy. The thickness per layer of Ba stearate is 24.40 Å. Traces of foreign substances in the H_2O affect the spacing by 1—3%. Equations are given for n (extraordinary ray), the intensity of the rays reflected from the upper surface and from the film solid boundary, the phase change at the boundaries, Brewster's angle, and other properties of birefringent films. Films formed at $p_H < 7.0$ consist of a mixture of stearic acid and neutral stearate; the former can be dissolved by C_6H_6 leaving a birefringent stearate skeleton

having $n < 1$ for the normal film. Measurements of n for various skeletons are given. N. M. B.

Electrokinetics. XVIII. Interfacial energy and the molecular structure of organic compounds. IV. Electrokinetic behaviour of charcoals in aqueous solutions of organic acids. V. L. FRAMPTON and R. A. GORTNER (J. Physical Chem., 1937, 41, 567—582).—Electrokinetic measurements with suspensions of C in aq. solutions of various aliphatic acids show that the adsorption of weak electrolytes on C is apolar. The adsorption of HCl, however, is polar. Activation does not appear to affect the electrokinetic properties of C, since the migration velocity of various charcoals suspended in H_2O is const. Graphite and diamond dust show speeds of the same order of magnitude as the more highly activated C samples. No electrokinetic evidence for positively charged C was obtained.

O. J. W.

Electrokinetics. XIX. Interfacial energy and the molecular structure of organic compounds. V. Electric moment of Al_2O_3 : benzene-nitrobenzene interface. R. A. GORTNER and H. B. BULL (Proc. Nat. Acad. Sci., 1937, 23, 256—258; cf. A., 1933, 122).—Streaming potentials, calc. ζ -potentials, and electric moments of the double layer for the interface Al_2O_3 : 0—100% C_6H_6 - $PhNO_2$ and 10—50% $PhOH$ - C_6H_6 mixtures have been determined. The results suggest the formation of bimol. compounds, although these are not indicated by the f.-p. curves, which show eutectics at respectively 51.3% $PhNO_2$ and 34.8% $PhOH$. It seems possible that electrokinetic measurements may be used for detecting mol. species which cannot be directly isolated.

N. M. B.

Influence of sodium ions on the ability of thin silver films to amalgamate. H. KEHLER (Z. Physik, 1937, 106, 296—310).—Apparatus is described for the prep. of thin Ag films on glass, mica, and collodion and their treatment with Na ions and Hg vapour. Bombardment with 100-e.v. ions renders the film partly passive to attack by Hg vapour. The resultant passivity \propto no. of ions but is independent of the time of bombardment. Of the three matrices used, glass alone gave non-reproducible results.

L. G. G.

Determination of the molecular size of dissolved substances on the basis of rate of dialysis according to H. Brintzinger. W. RATHJE, K. HESS, and M. ULMANN (Ber., 1937, 70, [B], 1403—1410).—Measurements of the rates of dialysis of α -methylglucoside and sucrose give almost const. dialysis coeffs. when the process occurs with small Δc against the solvent; the factor is not const. for the two types of sugar. As Δc increases the discrepancies in the dialysis const. tend towards higher vals. An explanation for the dependence of the dialysis const. on Δc cannot at present be given but it is not restricted to the sugars. The dependence of the dialysis const. on the concn. at practically const. and sufficiently small Δc is explained by the assumption of complex formation and mol. association. On account of the sp. influence of chemical constitution the dialysis method cannot be applied

with any considerable degree of exactitude to org. substances. The diffusion const. and osmotic pressure are similar in their dependence on concn. and in this respect the osmotic and diffusion methods are qualitatively complete and confirm one another.

H. W.

Theory of osmotic pressure, and Ulmann's method of measurement. Use of this method at higher temperatures. K. WOHL (Z. physikal. Chem., 1937, 179, 195—209).—Partly polemical against Thiel (this vol., 302). Mathematical examination of the effect of external pressure and gravity on the osmotic pressure of a solution shows that osmotic pressure may be regarded equally well as either a pressure or a suction. Ulmann's isothermal distillation method of measuring osmotic pressure ("Molekül-grossenbestimmung hochpolymerer Naturstoffe," 1936) is equiv. to establishing equilibrium between solvent and solution separated by a semipermeable membrane by exerting a pull on the solvent, and here the membrane acts like a series of capillary tubes. Preliminary experiments indicate that by this method the osmotic pressure of a given solution can be measured in the same apparatus at any temp. between room temp. and 80° .

R. C.

Diamagnetism of iodine solutions and the purity of alcohol. C. COURTY (Compt. rend., 1937, 205, 140—141; cf. this vol., 302).—The purity of EtOH may be tested by comparing χ for a solution of I in the specimen with the calc. val. A. J. E. W.

Flow dichroism of fluorescein solutions. S. NIKITINE (Compt. rend., 1937, 205, 124—126).—Dichroism due to flow has been observed in solutions of fluorescein in glycerol, in accord with theory.

A. J. E. W.

Slit photometer for the analysis of thin sections of coloured solutions: experimental confirmation of the diffusion equation. W. G. EVERSOLE and E. W. DOUGHTY (J. Physical Chem., 1937, 41, 663—671; cf. A., 1936, 288).—The diffusion coeff. of methylene-blue in 5% gelatin gels at 25° is 1.635×10^{-6} (cm.², sec.). A more accurate photometric apparatus for the analysis of coloured solutions is described.

F. R. G.

Apparent and partial molal volumes of ammonium chloride and of cupric sulphate in aqueous solution at 25° . J. N. PEARCE and G. G. PUMPLIN (J. Amer. Chem. Soc., 1937, 95, 1221—1222).—Mol. vols. have been calc. from measurements of d . The data are discussed in relation to Masson's law (A., 1930, 31).

E. S. H.

Diffusion constant of an electrolyte, and its relation to concentration. A. R. GORDON (J. Chem. Physics, 1937, 5, 522—526).—A semi-empirical equation is developed which gives vals. for the differential diffusion consts. (k) of KCl, NaCl, and KNO_3 in agreement with experiment. Cole and Gordon's rule (A., 1936, 1197) that the effective diffusion const. measured in a Northrup-McBain diaphragm cell has the same val. as k for the mean concn. is shown to be valid even when k does not vary linearly with concn., provided the total concn. range is $> 0.1N$.

J. W. S.

Colloids in glacial acetic acid. I. Elements, chlorides, sulphides, and sulphates. A. L. ELDER and P. N. BURKARD (*J. Physical Chem.*, 1937, **41**, 621—624).—Colloidal As, Se, S, P, Au, Pt, Ag, Cu, sulphides, chlorides, and sulphates in glacial AcOH have been prepared. O. J. W.

Purification of colloids by electrodialysis. L. KRATZ (*Kolloid-Z.*, 1937, **80**, 33—43).—The results of a crit. examination of the effectiveness of two existing electrodialysers in the purification of gum-arabic and serum-albumin sols are reported. The change of p_H with time during electrodialysis has been investigated and the influence of the apparatus and experimental conditions on this change discussed. The theory of electrodialysis is discussed. E. S. H.

Disperse gases. II. R. AUERBACH (*Kolloid-Z.*, 1937, **80**, 27—31; cf. A., 1936, 425).—The general conditions of formation and properties of gaseous dispersions are discussed, with special reference to stability and solubility, the influence of stabilisers, and particle size. Methods for the prep. of gaseous hydrosols by condensation and by dispersion are described. E. S. H.

Diffusion of heterodisperse substances. I. SAKURADA and M. TANIGUCHI (*Z. physikal. Chem.*, 1937, **179**, 227—234).—From Fick's law a diffusion equation for heterodisperse substances has been derived and the Stefan-Kawalki table shown to be approx. valid when the diffusion coeff., D , of the heterodisperse substance is defined by $D = 100^2 / (\sum c_i / \sqrt{D_i})^2$, where c_i and D_i are the % and diffusion coeff., respectively, of the component i . The applicability of the equation has been demonstrated by experiments with artificially prepared mixtures. R. C.

Individuality of cellulose micelles. O. KRATKY and H. MARK (*Z. physikal. Chem.*, 1937, **B**, 36, 129—139).—By X-ray examination alone it is impossible to decide whether the cellulose fibre consists of discrete micelles or whether the principal valency chains extend through several regions of crystallinity, but the general experimental evidence favours the latter alternative. Nevertheless, the increase in orientation caused by mechanical action seems to be explained most satisfactorily by postulating the presence of box-like cryst. regions, by rotation of which the increase in orientation is effected. R. C.

Internal solubility in soap micelles. A. S. C. LAWRENCE (*Trans. Faraday Soc.*, 1937, **33**, 815—820).—Experiments on the solubility of Nujol in soap solutions support the theory that H₂O-insol. hydrocarbon-sol. substances are dissolved in the interior of soap micelles by the hydrocarbon portion of the soap mol. The amounts of oil dissolved appear to be independent of the mol. wt. of the oil, but for Na, K, and Cs soaps they increase with increasing mol. wt. of the soap cation. C. R. H.

Asymmetry and orientation of clay micelles. S. HENIN (*Compt. rend.*, 1937, **204**, 1498—1499).—Reference is made to various methods by which birefringence and other properties indicative of micellar asymmetry and orientation may be demonstrated. R. M. M. O.

Dispersion of depolarisation of light-scattering colloids. III. R. S. KRISHNAN (*Proc. Indian Acad. Sci.*, 1937, **5**, A, 407—418; cf. this vol., 409).—Extinction coeffs. and depolarisation factors for Pt, Cu, Se, and Te sols have been measured between λ 2500 and 7000 Å. The particles are spherical, but the optical anisotropy increases somewhat in the ultra-violet. F. J. L.

Viscosity of sols made from X-irradiated agar. H. KERSTEN and C. H. DWIGHT (*J. Physical Chem.*, 1937, **41**, 687—689).—Irradiation of dry agar decreases the η and p_H of the resulting sol. F. R. G.

Coagulation of colloidal ferric hydroxide by mercury salts. K. JABŁCZYŃSKI and S. CIOŁEK (*Rocz. Chem.*, 1937, **17**, 196—200).—Positively charged Fe(OH)₃ sols are not coagulated by HgCl₂ or Hg(CN)₂, but if KCl is added coagulation follows. The effect is ascribed to formation of complex anions, of the type [HgCl₄]²⁻. R. T.

Directed coagulation of aerosols. II (I). Determination of the size of elementary magnets of nickel and iron. D. BEISCHER and A. WINKEL (*Naturwiss.*, 1937, **25**, 420—423; cf. A., 1936, 679).—Ferromagnetic properties are not associated with atoms of ferromagnetic elements, but with an aggregation of atoms with a definite orientation. The type of aggregate formed in aerosols of Ni and Fe, obtained by thermal decomp. of Ni and Fe carbonyls, has been examined by the ultra-microscope. Below the Curie point the aggregates are chain-like in contrast to the usual type of aggregation, which is spherical. The aggregation is practically instantaneous, whereas with other substances it may take a considerable time. It is considered that the directed aggregation is due to magnetic forces. If the aerosol is made above the Curie point, Fe and Ni aerosols aggregate to spherical particles. Determination of the size of the directed crystallites by observing the widening of the Debye-Scherrer pattern shows that the primary crystallites have the magnitude and form of the elementary particles assumed to be responsible for ferromagnetism by the Weiss-Heisenberg theory. A. J. M.

Ageing of fresh precipitates. XIII. Ageing of freshly precipitated silver chloride as indicated by the adsorption of wool-violet. I. M. KOLTHOFF and H. C. YUTZY (*J. Amer. Chem. Soc.*, 1937, **59**, 1215—1219; cf. A., 1936, 561, 791).—The ppt., when kept in the mother-liquor, undergoes a rapid decrease of surface as measured by the adsorption of wool-violet. Ageing is most pronounced in 0.001M-NaCl or EtOH, least in 0.001M-AgNO₃, and is promoted by NH₃. AgCl pptd. in presence of excess of Ag⁺ adsorbs more wool-violet than that pptd. from a solution containing excess of Cl⁻. E. S. H.

Potential and transport measurements on ferric hydroxide hydrosols. A. LOTTERMOSER and H. FRITZSCHE (*Kolloid-Z.*, 1937, **80**, 44—56).—Methods of determining the Cl⁻ activity of Fe(OH)₃ sols (prepared from FeCl₃), using Ag, AgCl, and Hg₂Cl₂ electrodes, are described. The results obtained by different methods are in agreement for the ultra-filtrate, but considerable differences are observed

when measurements are made on the sol. The causes of the disagreement are discussed. E. S. H.

Behaviour of inulin in liquid ammonia. F. W. BERGSTROM and A. E. GILMORE (J. Amer. Chem. Soc., 1937, 59, 1356—1358).—Inulin ppts. slowly when the solution is kept, forming a gel; it shows the Tyndall effect, and does not diffuse through a Cellophane membrane. E. S. H.

Influence of tervalent metal salts on solutions of gum arabic. R. HALLER and B. FRANKFURT (Kolloid-Z., 1937, 80, 68—72).—With increasing concn. of added Fe^{III} salts the η of gum arabic solutions falls slightly at first, then rises to a max., and subsequently falls again. The changes are more marked with increasing concn. of gum solution and are not influenced by temp. rise between 20° and 50° . Similar phenomena are observed on adding AlCl_3 or CrCl_3 to gum arabic solutions. Under certain conditions gels are formed. E. S. H.

Action of light on the Liesegang phenomenon. M. F. TABOURY and M. BELLOT (Compt. rend., 1937, 205, 45—47).—From experiments on the pptn. of Ag_2CrO_4 in agar, it is shown that light of λ 4000—4960 Å. favours and light of longer λ prevents rhythmic pptn. C. R. H.

Silicic acid gels. VII. Effect of the soda-silica ratio on the time of set. C. B. HURD, W. FIEDLER, and C. L. RAYMOND (J. Physical Chem., 1937, 41, 553—561; cf. A., 1936, 288).—No difference in time of set is found in gels obtained by mixing aq. Na silicate and aq. AcOH with varying $\text{NaOH}:\text{SiO}_2$ ratio (1:2 to 1:3.25) at 25° . The theory of the setting of these gels is discussed. O. J. W.

Ionic exchange in relation to hydrogen-ion concentration and rigidity of silicic acid jellies. J. H. HANKS and R. L. WEINTRAUB (J. Physical Chem., 1937, 41, 583—592).—A method for preparing SiO_2 gels at any p_{H} is described. The influence of time, temp., dialysis, and autoclaving on the $[\text{H}^+]$ and rigidity of SiO_2 gels has been studied. O. J. W.

Spinning properties of liquids. IV. Liquefying effect of calcium salts on gelatin. H. ERBRING (Kolloid-Z., 1937, 80, 20—27; cf. A., 1936, 1200).—When $\text{Ca}(\text{SCN})_2$, $\text{Ca}(\text{NO}_3)_2$, or CaCl_2 is added to conc. gelatin solution, η decreases strongly to a min. at 1.4M, afterwards increasing with increasing concn. of Ca salt. This effect is ascribed to an initial dispersing, followed by a coagulating, influence. The abs. val. of η is influenced by the anion. With low and high salt concns. sol thixotropy is marked, although less strongly with intermediate concns. Optimum spinning properties are observed in the concn. regions corresponding with the beginning of liquefaction and of coagulation. During spinning, double refraction due to stretching is observed. E. S. H.

Action of monohydric alcohols on gelatin gels. J. A. SAUNDERS (Biochem. J., 1937, 31, 1093—1096).—The action of MeOH , EtOH , Pr^{OH} , Bu^{OH} , and Bu^{OH} on gelatin gels is studied. On immersion in the alcohols the gels are dehydrated with absorption

of the alcohol. On re-swelling in H_2O the gels increase in wt. rapidly for 3 days and thereafter at a rate similar to that of the swelling of untreated gels in H_2O . In dil. solutions of EtOH the gel first decreases and then increases in wt. whilst in solutions containing $>20\%$ of EtOH the wt. steadily decreases. Swelling in H_2O involves a readjustment of the gel structure with imbibition but small amounts of EtOH prevent this readjustment. E. A. H. R.

Effect of X-radiation on the ζ -potential of colloidal graphite. J. A. CROWTHER and H. LIEBMANN (Nature, 1937, 140, 28—29).—When irradiated by increasing doses of X-rays the ζ -potential of a colloidal dispersion of graphite alternately increases and decreases. L. S. T.

Ratio of electro-osmotic mobility along a flat surface to electrophoretic mobility of particles of ultramicroscopic size. A. R. WILLEY and F. HAZEL (J. Physical Chem., 1937, 41, 699—710).—According to observations made with Fe_2O_3 and gelatin in a Mattson electrophoresis cell, the ratio of electro-osmotic to electrophoretic mobility is unity and the validity of the Smolouchowski equation thus appears to be independent of the particle size. F. R. G.

Mobility data in determining the composition of colloidal micelles. B. COHEN (J. Physical Chem., 1937, 41, 711—713).—The bound and unbound portions of the constituents of a colloidal solution are considered in relation to their mobilities. F. R. G.

Electrophoresis of lamellæ at the interface of liquid phases. L. I. BELAEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 249—253).—The motion of lamellar films, formed at the interfaces between immiscible liquid phases, under the influence of an electric field applied in the plane of the films has been investigated. Movement towards one or both electrodes may occur. The mechanism of the process is discussed. A. J. E. W.

Physico-chemical properties of electro-dialysed gels of silica, alumina, and ferric oxide and their mixtures. III. Cataphoretic velocity and p_{H} . P. B. BHATTACHARYYA (J. Indian Chem. Soc., 1937, 14, 225—230; cf. this vol., 81).—The cataphoretic velocity and p_{H} of unmixed and mixed gels of SiO_2 , Al_2O_3 , and Fe_2O_3 saturated with various cations are recorded. For SiO_2 , $\text{Al}_2\text{O}_3 + \text{SiO}_2$, and $\text{Fe}_2\text{O}_3 + \text{SiO}_2$ gels the cataphoretic velocity is in the order $\text{Na} > \text{K} > \text{Mg} > \text{Ca} > \text{unsaturated H gel}$; and for $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ the reverse. The p_{H} of all the gels is 5—7. F. J. L.

Present state of the theory of electrolytes. A. E. BRODSKI (Trav. Congr. Jubil. Mendeléev, 1937, 2, 426—445).—A discussion. C. R. H.

Interionic attraction theory of electrolysis. D. A. MACINNES (Science, 1937, 86, 23—29). L. S. T.

Recent advances in the electrochemistry of non-aqueous solutions. A. W. DAVIDSON (J. Chem. Educ., 1937, 14, 218—227). L. S. T.

Second dissociation constant of carbonic acid. Y. KAUKO and A. AIROLA (Z. physikal. Chem., 1937,

179, 307—313).—From the dissociation const. (this vol., 241) the heat of dissociation has been calc. to be 3820 at 0—25° and 3550 g.-cal. at 25—38°. R. C.

Dissociation constants of *d*-glucoascorbic acid and of its product of oxidation by iodine. Ultra-violet absorption spectra of *d*-glucoascorbic acid. G. CARPENT (Compt. rend., 1937, 205, 273—275).—For *d*-glucoascorbic acid the electrometric vals. are 5.5×10^{-5} and 2.63×10^{-12} , whilst the spectroscopic vals. are 7.1×10^{-6} and 0.56×10^{-12} . On titration of oxyglucoascorbic acid, time being allowed for attainment of equilibrium, the consts. obtained were 2.2×10^{-4} and 7.1×10^{-9} . Back-titration with HCl gave 1.6×10^{-3} , 6.3×10^{-5} , and 1.6×10^{-9} , whilst rapid titration gave approx. 2.8×10^{-9} .

F. J. G.

Ionisation of acetic acid in aqueous sodium chloride solutions from 0° to 40°. H. S. HARNED and F. C. HICKEY (J. Amer. Chem. Soc., 1937, 59, 1284—1288).—E.m.f. data for the cells $H_2|AcOH(M), NaCl(m)|AgCl, Ag$ with 0.2—0.5*M*-AcOH and 0.05—3*M*-NaCl are recorded at 5° intervals from 5° to 40°. The ionisation const. and activity coeff. of AcOH have been calc. The total heat of ionisation of AcOH and the relative partial mol. heat content of its ions in NaCl solutions have been derived.

E. S. H.

Hydrolysis of acetate ion in sodium chloride solutions. H. S. HARNED and F. C. HICKEY (J. Amer. Chem. Soc., 1937, 59, 1289—1290).—The reaction has been studied by measurement of e.m.f. of the cells $H_2|NaOH(m_0), NaCl(m)|AgCl, Ag$ and $H_2|AcOH(M), NaCl(m)|AgCl, Ag$ at 0—40° and 0—3*M*-NaCl. At 25—40° the total deviation from the mass action law is $\geq 4\%$.

E. S. H.

Constitution of water in solutions of strong electrolytes. II. C. S. RAO (Indian J. Physics, 1937, 11, 143—163).—Extension of earlier work (A., 1935, 295) shows that the Raman H_2O band is sharper in solutions of strong electrolytes than in the pure solvent, and is shifted towards higher frequency. The position of the intensity max. is determined by the anion and is independent of the cation. Changes in the structure of the band are, however, mainly attributable to changes in the hydration of the cation.

F. J. L.

Interpretation of f.-p. lowering data in terms of polymerisation. E. N. LASSETTRE (J. Amer. Chem. Soc., 1937, 59, 1383—1387).—The method of calculating equilibrium consts. of polymerisation reactions from f.-p., b.-p., and distribution data is described. The method has been applied to various compounds and an empirical equation derived. The same type of equation also holds for the distribution of PhOH between $CHCl_3$ and H_2O .

E. S. H.

Influence of solvents on the course of chemical reactions. XV.—See A., II, 339.

Tautomeric equilibria of nitrosonaphthol-naphthaquinoneoxime systems. H. S. FRENCH and D. J. PERKINS (J. Amer. Chem. Soc., 1937, 59, 1182—1186).—The solvent effects ($EtOH$, Et_2O , and *cyclohexane*) on the absorption spectra of $PhNO$, $1-C_{10}H_7NO$, 1:2-naphthaquinonedioxime, and 1:2-

2:1-, and 4:1-nitrosonaphthols have been determined. The results afford evidence that the quinonoid modification predominates in the quinonoid-benzenoid equilibria of the nitrosonaphthols.

E. S. H.

Binary systems in which one component exhibits a heterogeneous transformation with heterogeneous hysteresis. A. SMITS and G. J. MULLER (Z. physikal. Chem., 1937, B, 36, 146—154).—Assuming that the second component facilitates transition from oscillation to rotation by removal of inhibitions and that the hysteresis region diminishes and ultimately disappears with increase in the concn. of this component, the *T*-*X* diagram would be expected to show the effect of this component on the hysteresis of the transformation in the mixed crystals. Owing to the difficulty of the experimental determination of this diagram, *V*-*T* lines statically determined for mixtures of various compositions are used instead. Sp. heat measurements throw no light on the effect of the second component on the hysteresis (cf. this vol., 74).

R. C.

Thermodynamics of ionised water in lithium bromide solutions. H. S. HARNED and J. G. DONELSON (J. Amer. Chem. Soc., 1937, 59, 1280—1284).—E.m.f. vals. for the cells $H_2|LiOH(0.01), LiBr(m)|AgBr, Ag$ and $H_2|HBr(0.01), LiBr(m)|AgBr, Ag$ have been determined at 5° intervals from 0° to 50°. The ionisation const. of H_2O , the standard e.m.f. of the $AgBr, Ag$ electrode, the activity coeff., the relative partial mol. heat content of HBr in aq. $LiBr$, and the ionic activity coeff. product and heat of ionisation of H_2O in aq. $LiBr$ have been calc.

E. S. H.

Thermodynamics of aqueous potassium chloride solutions from electromotive force measurements. H. S. HARNED and M. A. COOK (J. Amer. Chem. Soc., 1937, 59, 1290—1292).—E.m.f. data for the cells $Ag, AgCl|KCl(m)|K_2Hg|KCl(0.05)|AgCl, Ag$ with 0.1—4*M*-KCl are recorded at 5° intervals from 0° to 40°. The activity coeff., relative partial mol. heat content, and relative partial mol. heat capacity of KCl have been calc.

E. S. H.

Equilibrium between hydrogen sulphide and heavy water. P. A. SMALL (Trans. Faraday Soc., 1937, 33, 820—823).—The mean val. for the const. for the reaction $H_2S_{gas} + HDO_{liq} \rightleftharpoons HDS_{gas} + H_2O_{liq}$ is 0.422 ± 0.019 , and for the reaction $H_2S_{gas} + HDO_{gas} \rightleftharpoons HDS_{gas} + H_2O_{gas}$ is 0.453 ± 0.020 at 15°. The latter val. is compared with vals., 0.436 and 0.448, derived respectively from considerations of zero-point energy and from spectroscopic data.

C. R. H.

Calculation of equilibrium constants and activation energies for some reactions involving various isotopic species of hydrogen, water, and hydrogen sulphide. T. JONES and A. SHERMAN (J. Chem. Physics, 1937, 5, 375—381).—By the methods of statistical mechanics the partition function ratios for pairs of the different isotopic species of H_2 , H_2O , and H_2S have been calc. and from these the equilibrium consts. for isotopic exchange reactions are derived. Where possible, comparison is made between the vals. obtained and those pre-

viously determined theoretically or experimentally. The calculations cover the temp. range 273° to 1000° abs. and the temp. variation of the equilibrium consts. is shown. Activation energies are calc. The various isotopic exchange reactions in the gas phase and in the absence of catalysts fall into three groups: (a) isotopic exchange will occur between H_2 and H_2O and between H_2 and H_2S at high temp. (500°) by chain mechanisms; (b) exchange between isotopic species of H_2O and H_2S will occur at approx. 400° by a bimol. and chain mechanism; and (c) at 200° to 300° exchange between H_2O and H_2S will occur by a bimol. mechanism. W. R. A.

Vapour pressures and activity coefficients of aqueous solutions of ammonium chloride at 25°. J. N. PEARCE and G. G. PUMPLIN (J. Amer. Chem. Soc., 1937, 59, 1219—1220).—V.p. data for the whole range of concn. are recorded. The activities of the solvent, the geometric mean activities of the solute, and the free energies of dilution have been calc. E. S. H.

Vapour pressures of aqueous solutions of sodium nitrate and potassium thiocyanate. J. N. PEARCE and H. HOPSON (J. Physical Chem., 1937, 41, 535—538; cf. A., 1935, 302).—V.p. of aq. solutions of $NaNO_3$ and of $KCNS$ at 25° have been measured, and the apparent and partial mol. vols. calc. O. J. W.

Vapour pressures and some thermodynamic properties of aqueous solutions of nickel chloride at 25°. J. N. PEARCE and H. C. ECKSTROM (J. Physical Chem., 1937, 41, 563—565).—V.p. and d of aq. $NiCl_2$ at 25° have been measured, and the activity of the solvent and partial and apparent mol. vol. of the dissolved salt calc. The solubility of $NiCl_2$ in H_2O at 25° is 4.91 mols. per 1000 g. of H_2O . O. J. W.

Vapour pressures of saturated solutions. W. W. EWING (J. Amer. Chem. Soc., 1937, 59, 1293—1294).—The conclusions of Roehl (A., 1936, 1069) are inapplicable to many salt solutions. E. S. H.

Vapour pressures of saturated aqueous solutions. W. A. WEST and A. W. C. MENZIES (J. Amer. Chem. Soc., 1937, 59, 1294—1297).—The curves obtained by plotting the logarithm of the v.p. of saturated aq. solutions against reciprocal temp. may show many types of slope or curvature. The slopes of these curves are interpreted by means of Roozeboom's equation $d \log P/dT = [q + Q_c/(x - c)]/2T^2$, where q is the mol. heat of vaporisation of H_2O , Q_c the integral heat of dissolution for 1 formula-wt. of the solid phase in forming its saturated solution from H_2O , x the total mols. of H_2O containing 1 mol. of anhyd. solute, and c the mols. of H_2O of crystallisation in 1 formula-wt. of the solid phase. E. S. H.

Thermodynamic properties of saturated aqueous solutions of salt systems. I. Specific heat and vapour pressure of the system $BaCl_2-H_2O$ at 25°. E. N. VARASOVA, K. P. MISCHTSCHENKO, and O. I. FROST (J. Gen. Chem. Russ., 1937, 7, 1284—1291).—The solubility of $BaCl_2$ falls practically to zero in 25% $CaCl_2$. Sp.

heat and v.p. data are given for saturated solutions at 25°. R. T.

Continuity of the metastable state. A. VAN HOOK (J. Physical Chem., 1937, 41, 593—596).—The temp.-dilatation curves for supersaturated aq. solutions of KNO_3 , $(NH_4)_2C_2O_4$, $H_2C_2O_4$, $Ca(NO_3)_2$, NH_4Ac , and $CO(NH_2)_2$ are found to be quite continuous at the saturation point. The principle of the continuity of properties into the metastable state is generally valid. O. J. W.

Dissociation of natural zinc carbonate, a reaction in which a mixed condensed phase intervenes. M. DONÉ (Compt. rend., 1937, 204, 1938—1939; cf. this vol., 81).—The calc. composition of the condensed phase accords with the observed vals. at a series of temp. J. G. A. G.

Thermal dissociation of bismuth sulphide. J. I. GERASIMOV (J. Gen. Chem. Russ., 1937, 7, 1333—1338).—The equilibrium coeffs. for the reaction $Bi_2S_3 + 3H_2 \rightleftharpoons 2Bi + 3H_2S$ have been determined at 370—590°; the results of earlier workers are on the whole confirmed. The dissociation pressure and heat of formation of Bi_2S_3 are calc. R. T.

Physico-chemical analysis in relation to the sulphuric acid treatment of phosphates. I. Ternary system $CaO-P_2O_5-H_2O$, at 80°. A. P. BELOPOLSKI, A. A. TAPEROVA, M. T. SEREBRENNIKOVA, and M. N. SCHULGINA (J. Chem. Ind. Russ., 1937, 14, 504—507).—Equilibrium data are given for the system $CaO-P_2O_5-H_2O$, at 80°, for the range 0.13—48.9% P_2O_5 . R. T.

Phase-rule studies of the calcium arsenates. G. W. PEARCE and A. W. AVENS (J. Amer. Chem. Soc., 1937, 59, 1258—1261).—The system $CaO-As_2O_5-H_2O$ has been studied at 35°. The existence of $CaHAsO_4$, $Ca_5H_2(AsO_4)_4$, and $Ca_3(AsO_4)_2$ has been confirmed. No basic Ca arsenate was found. E. S. H.

Soda alum system. J. T. DOBBINS and L. C. THOMAS (J. Physical Chem., 1937, 41, 655—661).—Isotherms for the system $Na_2SO_4-Al_2(SO_4)_3-10\% H_2SO_4$ at 50°, 42°, and 30°, and dilatometer measurements at 41—46°, show that $Na_2SO_4 \cdot Al_2(SO_4)_3 \cdot 14H_2O$ is stable below, and the hexahydrate above, 42.9—43.4°. F. R. G.

Ternary system $FeO-Al_2O_3-SiO_2$. R. HAY, J. WHITE, and T. H. CAULFIELD (J. Soc. Glass Tech., 1937, 21, 270—280).—A diagram has been constructed from thermal and microscopic data. Four ternary combinations occur: (1) FeO , spinel, fayalite, (2) fayalite, spinel, mullite, (3) fayalite, SiO_2 , mullite, (4) Al_2O_3 , spinel, mullite. Three ternary eutectic points occur; all these approximate to the composition of fayalite. C. L. M.

Certain physical constants of mixtures of hydrocarbons. A. V. LOZOVOL, M. K. DJAKOVA, and T. G. STEPANTZEVA (J. Gen. Chem. Russ., 1937, 7, 1119—1132).— n^{20} , d_4^{20} , and NH_2Ph point data are recorded for binary mixtures of C_6H_6 , $PhMe$, o -, m -, and p -xylene, s - $C_6H_5Me_3$, 1 : 2 : 4 : 5- $C_6H_2Me_4$, C_6HMe_5 , C_6Me_6 , $PhEt$, $PhPr^a$, and p - $C_6H_4MePr^b$ with the corresponding H_g -derivatives. R. T.

The system acetylene-liquid oxygen, and explosions in rectification plants. I. P. ISCHKIN, P. Z. BURBO, and A. G. PASCHKOVSKAJA (J. Chem. Ind. Russ., 1937, 14, 560—566).—The solubility of C_2H_2 in liquid O_2 is determined at -183° , by the Ag_2C_2 pptd. on passing the gas through ammoniacal $AgNO_3$ in 80% $COMe_2$. Cryst. C_2H_2 separates from supersaturated solutions, and may be removed by filtration; the $[C_2H_2]$ of the filtrate is high enough to render explosion possible, but the pressure developed during the explosion is not great enough to destroy the condenser. R. T.

Binary systems of fatty acids. M. KULKA and R. B. SANDIN (J. Amer. Chem. Soc., 1937, 59, 1347—1349).—F.p.-composition curves have been determined for the systems myristic-palmitic, decaic-lauric, and undecic-lauric acids. E. S. H.

Binary systems containing carbamide. A. S. VETROV (J. Gen. Chem. Russ., 1937, 7, 1093—1095).—Hydrate formation is not observed in the system $CO(NH_2)_2-H_2O$. Formation of a 1:2 compound is confirmed for the system $CO(NH_2)_2-AcOH$. R. T.

Activity coefficients of nitrobenzene in binary systems with certain benzene derivatives. K. HRYNAKOWSKI, H. STASZEWSKI, and M. SZMYTÓWNA (Rocz. Chem., 1937, 17, 189—195).—The eutectic mixture of $PhNO_2$ and C_6H_6 contains 59.1 mol.-% of $PhNO_2$, and melts at -21.2° ; the corresponding vals. for the system $PhNO_2-PhOH$ are 58.3 and -16.4° , and for $PhNO_2-BzOH$ 95.6 and 3.9° . The fusion diagram of the system $PhNO_2-PhCHO$ could not be realised, owing to formation of glassy resins. The activity coeff. of $PhNO_2$ has approx. the same val. in all the above systems. R. T.

The system α -naphthol-salicylic acid. A. CASTIGLIONI (Gazzetta, 1937, 67, 244—247).—The van der Waals equation is applied on the assumption that the heat of mixing is zero, and heats of fusion are calc. in agreement with recorded vals. The eutectic is at 21.3% salicylic acid. E. W. W.

Existence and nature of acid soaps. P. EKWALL (Kolloid-Z., 1937, 80, 77—100).—A summary of published work. E. S. H.

Thermal decomposition of mixed ammonium-calcium permutites, bentonites, and clays. O. BOTTINI (Kolloid-Z., 1937, 80, 56—59).—The % dissociation (NH_3 loss) of the mixed substances has been determined at different temp. between 50° and 550° . The different results obtained for the same substance according to the method of prep. show that the intermicellar bound NH_4^+ is more resistant to thermal decomp. than is the extramicellar NH_4^+ . E. S. H.

Heat capacity and entropy of silver nitrate from 15° to 300° abs. Heat and free energy of dissolution in water and dilute aqueous ammonia. Entropy of silver ammonia complex ion. W. V. SMITH, O. L. I. BROWN, and K. S. PITZER (J. Amer. Chem. Soc., 1937, 59, 1213—1215).—Heat capacities have been determined. The entropy of $AgNO_3$ at 298.1° abs. is 33.68 e.u., the heat of dissolution in H_2O $5360+50$ g.-cal. per mol., free

energy of dissolution in H_2O -510 g.-cal. per mol., and free energy of formation of solid $AgNO_3$ from its elements -7350 g.-cal. per mol. The heat of dissolution of $AgNO_3$ in dil. aq. NH_3 has been determined. The entropy of $Ag(NH_3)_2^+$ is 58.7 e.u. at 298.1° abs. E. S. H.

Calculation of the change in free energy in the formation of tricalcium silicate from calcium oxide and β -dicalcium silicate. H. A. SHADDUCK (J. Physical Chem., 1937, 41, 625—628).—The calc. change of free energy for the reaction is small and becomes negative at about 900° . O. J. W.

Homology and isomerism in long-chain compounds. I. Thermochemical study of the n -alkyl esters derived from the monoethylenic monocarboxylic acids in C_{18} . L. J. P. KEFFLER (J. Physical Chem., 1937, 41, 715—721).—Isothermal heats of combustion are recorded for Me, Et, Prⁿ, and Buⁿ oleates and Me, Et, Prⁿ, Buⁿ, and amyl elaidates. The val. for Et oleate is exceptionally $<$ that of Et elaidate. The CH_2 increment for the elaidates is equal to that for the alcohols, but for the oleates it is irregular. F. R. G.

Application of thermal analysis to determination of thermal effects in binary and ternary systems. K. HRYNAKOWSKI and A. SMOCZKIEWICZOWA (Rocz. Chem., 1937, 17, 181—185).—The heats of fusion of the eutectic mixtures correspond with calc. vals. in absence of compound formation [systems α - β - $C_{10}H_7\cdot OH$, $NH_2Ac-CO(NH_2)_2$, phenacetin-antipyrine-sulphonol], but not when compounds are formed [α - $C_{10}H_7\cdot OH-CO(NH_2)_2$, $NH_2Ac-\beta$ - $C_{10}H_7\cdot OH$]. R. T.

Energy and volume changes on chemical reaction. G. BECK (Z. anorg. Chem., 1937, 233, 151—154).—Vol. change (at 0° abs.) on compound formation is compared with the energy of formation Q by reference to the equation $V_a/V_e = e^{a+b}$, in which V_a and V_e are the initial and final vols. and $a = Q/hcR$. For fluorides a and b are nearly equal but for other halides $b < a$. On the other hand for metallic oxides and anhydrides of strong acids $b \gg a$, so that the energy change is abnormally low and further combination to form salts is possible. Since nitrides resemble oxides in having $b \approx a$ these should be able to combine with acid anhydrides. F. J. G.

Thermodynamics of the electric field with special reference to chemical equilibrium. F. O. KOENIG (J. Physical Chem., 1937, 41, 597—620).—The general thermodynamic equations for dielectrics permeated by electric fields are extended to include the case of variable composition. The chief laws of equilibrium in a non-uniform field are derived. O. J. W.

Behaviour of organic nitrogen and sulphur compounds in anhydrous hydrogen fluoride. W. KLATT (Z. anorg. Chem., 1937, 232, 393—409; cf. A., 1935, 582).—B.p. and conductivity measurements have been made for solutions of nitro-, amino-, azo-, and diazo-compounds, aromatic ethers, and S compounds. Additive cations are formed in most cases and the original compounds are recoverable; those containing negative groups are least sol. and

their additive compounds show the smallest conductivity. $X \cdot NO_2$ (X = alkyl or aryl) is, however, more sol. and $X \cdot Hal$ less sol. than HX .

F. R. G.

Effect of betaine on the conductivity of sodium hydroxide solutions. R. F. NIELSEN (J. Physical Chem., 1937, 41, 723—727).—The effect of betaine on the equiv. conductivity of 0.5*N*- to 1*N*-NaOH is about half that of an equimol. quantity of NaOH.

F. R. G.

Influence of time on the normal Wien effect. H. FALKENHAGEN, F. FROLICH, and H. FLEISCHER (Naturwiss., 1937, 25, 446—447).—The theoretical explanation of the results of Wien for electrolytes, previously limited to the stationary case (A., 1931, 686), has been extended to cover the dependence of the normal Wien effect on frequency, and the influence of time and potential.

A. J. M.

Transport numbers of ions in solutions of silver dodecyl sulphate. O. R. HOWELL and H. WARNE (Proc. Roy. Soc., 1937, A, 160, 440—454).—Transport nos. have been determined by the Hittorf method at 40°. The change in transport no. with increasing concn. occurs in three ranges. In the first range, where the conductivity falls, the transport no. of the anion falls rapidly; the mobility of the anion falls rapidly whilst that of the cation increases slightly. This is consistent with the view that the salt is present as a simple completely dissociated electrolyte. In the second range where the electrical conductivity falls rapidly, the transport no. of the anion rises and the mobility of anion increases whilst that of cation falls rapidly. These facts are in agreement with the view that the long-chain ions are unable to pass one another and move as a complete network through which cations cannot pass. The formation of micelles in this range will not account for all the facts. In the third range where the conductivity is const., the transport no. of the anion decreases slightly, the mobility of cation increases whilst that of anion diminishes. The observations are compatible with the existence of micelles in this range.

G. D. P.

Normal potential of the mercury-mercurous iodide electrode at 25°. R. G. BATES and W. C. VOSBURGH (J. Amer. Chem. Soc., 1937, 59, 1188—1190).—E.m.f. measurements with the cell $Hg|Hg_2I_2, HI|HI|H_2(Pt)$ at 25° give $E_{25}^\circ = 0.0405$ volt. The normal potentials of the $Pb(Hg)|PbI_2$ and I electrodes have been calc.

E. S. H.

Standard state of copper. Copper-cupric electrode. L. M. ADAMS and D. J. BROWN (J. Amer. Chem. Soc., 1937, 59, 1387—1388).—Cu in the standard state has been prepared by the action of org. reducing agents on $CuSO_4$ in SiO_2 gel. The normal electrode potential is 0.3472 volt.

E. S. H.

Saturated standard cells with small temperature coefficients. II. W. C. VOSBURGH, M. GUAGENTY, and W. J. CLAYTON (J. Amer. Chem. Soc., 1937, 59, 1256—1258; cf. A., 1925, ii, 1164).—A cell with e.m.f. 1.0184 volt at 25° and temp. coeff. 0.000013 volt per degree is obtained by substitution of Cd-Bi amalgam for Cd amalgam in the Weston cell

II (A., I.)

and saturation of the electrolyte with $CdSO_4, Na_2SO_4, 2H_2O$ as well as $3CdSO_4, 8H_2O$.

E. S. H.

Electrode potentials of platinum, gold, and silver in various solutions of electrolytes. I. M. KOLTHOFF and C. WANG (J. Physical Chem., 1937, 41, 539—544).—Au and Pt electrodes in $CuSO_4$ and $Cu(NO_3)_2$ solutions behave as air electrodes, and the potential is not affected by $[Cu^{++}]$. After removal of air by N_2 , the electrodes no longer behave as air electrodes and apparently the oxidation potential of the Cu solutions is measured. In $AgNO_3$ solutions ($>0.01M$) Au and Pt electrodes indicate the oxidation potential of the process $Ag^+ + e \rightarrow Ag$. The potentials are only very slightly affected by a change of $[H^+]$ or by the removal of O_2 by means of N_2 . In all cases the noble metals are easily polarised, and the systems are not suitable for exact measurements.

O. J. W.

Electrode potentials and adsorbed ionic films. H. HUNT, J. F. CHITTUM, H. V. TARTAR, and H. K. MCCLAIN (J. Amer. Chem. Soc., 1937, 59, 1400).—The effect observed by Tartar and McClain (A., 1931, 1237) does not appear to be due to the rearrangement of an adsorbed ionic film.

E. S. H.

Argentate salts in solution. V. Oxidation potentials, equilibria with higher silver oxides, and formation of nitrate complexes. A. A. NOYES, D. DEVAULT, C. D. CORYELL, and T. J. DEAHL (J. Amer. Chem. Soc., 1937, 59, 1326—1337; cf. this vol., 465).—The formal oxidation potential of Ag in 4.0*f*- HNO_3 and 4.0*f*- $HClO_4$ at 0° and 25° has been measured. Vals. of ΔF_{298}° and ΔH are given. Evidence that Ag^{II} in HNO_3 exists mainly in the form of nitrate complexes is adduced. On the average, 1.6 NO_3 is bound per atom of Ag^{II} . The prep. and properties of pure AgO are described; treatment with HNO_3 converts it into Ag^{II} oxynitrate, having the empirical composition $AgO_{1.146}(NO_3)_{0.153}$. An unstable oxide or basic salt of Ag^{III} is pptd. by electrolysing $AgClO_4-HClO_4$ solutions; it is also formed on the surface of AgO when treated with $AgClO_4$.

E. S. H.

Strong oxidising agents in nitric acid solution. III. Oxidation potential of cobaltous-cobaltic salts: kinetics of the reduction of cobaltic salts by water. A. A. NOYES and T. J. DEAHL (J. Amer. Chem. Soc., 1937, 59, 1337—1344; cf. A., 1936, 1072).—From e.m.f. measurements the formal oxidation potential for $Co^{III} \rightarrow Co^{II}$ is calc. to range from 1.800 volts in 1*f*- HNO_3 to 1.816 volts in 4*f*- HNO_3 at 0°, and from 1.842 volts in 3*f*- HNO_3 to 1.850 volts in 4*f*- HNO_3 at 25°. The decrease in free energy and heat content have also been calc.

E. S. H.

Oxidation-reduction potentials of a series of nitrosobenzene-phenylhydroxylamine systems. R. E. LUTZ and M. R. LYTTON (J. Org. Chem., 1937, 2, 68—75).—The oxidation-reduction potential of the system, $Ar \cdot NO \rightleftharpoons Ar \cdot NH \cdot OH$, is determined by titration with $TiCl_2$ in 50% aq. $COMe_2$ containing 0.1*N*- HCl , Ar being Ph or Ph substituted by Me, Et, F, Cl, Br, I, OMe, OEt, CO_2Me , CO_2Et , CO_2Pr , or NO_2 . *m*- and *o*-*p*-Directing groups in the *o*-

position raise the potential, CO_2R and NO_2 being most effective. In the *p*-position *o-p*-directing groups lower and *m*-directing groups raise the potential. In the *m*-position the effect is always small. These results are compared with corresponding data for the quinone series. The following are new: 5-nitroso-m-xylene, m.p. 59° ; *o*-, m.p. 61° , and *m*-nitrosoethylbenzene, m.p. 22° ; *Pr* ^{β} *p*-nitrosobenzoate, m.p. 61 – 62° ; *o*-, m.p. 117° , and *m*-iodonitrosobenzene, m.p. 77° ; *m*- and *p*-nitrosoethoxybenzene were obtained, but not pure. Prep. by FeCl_3 is usually most satisfactory. R. S. C.

Theory of overpotential of hydrogen and its catalytic lowering at the dropping mercury cathode. J. HEYROVSKY (Trav. Congr. Jubil. Mendeleev, 1937, 2, 299–303).—The lowering of H_2 overpotential is attributed to increased adsorption of H^+ in the surface layer, and to a catalytic effect in the metallic phase which brings about union of H atoms and H^+ . This may be a "metallic catalysis" brought about by metals of the Pt group, or a "solution catalysis" brought about by alkaloids of the quinoline group or by certain compounds containing the SH group. C. R. H.

Kinetics of thermal polycondensation reactions. H. DOSTAL (Monatsh., 1937, 70, 324–328).—Theoretical; a reply to Flory (this vol., 249). F. J. G.

Pyrolysis of ethane. H. H. STORCH and L. S. KASSEL (J. Amer. Chem. Soc., 1937, 59, 1240–1246).—The production of CH_4 has been traced to the reactions $\text{C}_2\text{H}_6 = \text{CH}_4 + 0.5\text{C}_2\text{H}_4$ and $\text{C}_2\text{H}_6 + \text{C}_2\text{H}_4 = \text{CH}_4 + \text{C}_3\text{H}_6$, the rates of which have been determined. The initial rate of dehydrogenation of C_2H_6 is of first order from 200 to 1500 mm. and can be expressed by $d[\text{H}_2]/dt = k[\text{C}_2\text{H}_6] - k'[\text{H}_2][\text{C}_2\text{H}_4]$. Side reactions also occur. A free radical chain mechanism does not apply to the whole reaction, but may be concerned in a small part. A low val. for the equilibrium const. of the dehydrogenation reaction has been obtained. E. S. H.

Influence of pressure on the spontaneous ignition of inflammable gas-air mixtures. The simpler olefines. G. P. KANE and D. T. A. TOWNEND (Proc. Roy. Soc., 1937, A, 160, 174–187).—Previous work on ignition-point-pressure curves of paraffin hydrocarbons (cf. A., 1936, 801; this vol., 247) is extended to the olefines ethylene, propylene, Δ^2 -butene, and Δ^2 -amylene. For mols. of $> \text{C}_3$ the results are similar to those obtained with the corresponding paraffins. The effect of small amounts of NO_2 (0.1 and 1%) and Et_2O (0.1 and 0.5%) is investigated. G. D. P.

Thermal decomposition of ethylene dibromide. T. IREDALE and A. MACCOLL (Nature, 1937, 140, 24–25).— $\text{C}_2\text{H}_4\text{Br}_2$ decomposes at 340 – 370° in Pyrex into vinyl bromide and HBr . The decomp. is heterogeneous; the introduction of Pyrex glass tubing markedly increases the reaction velocity. The reverse reaction is inappreciable at these temp., and there is no decomp. into C_2H_4 and Br_2 . L. S. T.

Thermal decomposition of ethylene oxide. M. W. TRAVERS and C. G. SILCOCKS (Nature, 1937,

139, 1018).—When heated together at 400° , $(\text{CH}_3)_2\text{O}$ and MeCHO yield approx. ten times as much $\text{CO} + \text{CH}_4$ as when heated separately. This supports the view that in the thermal decomp. of $(\text{CH}_3)_2\text{O}$, although only small amounts of MeCHO can be detected, it is the change $(\text{CH}_3)_2\text{O} \rightarrow \text{MeCHO}$ that forms the background reaction preceding the final decomp. The main reaction would be initiated by the collision of mols. of $(\text{CH}_3)_2\text{O}$ and MeCHO : $(\text{CH}_3)_2\text{O} + \text{MeCHO} = [(\text{CH}_3)_2\text{O}, \text{MeCHO}] = 2\text{CH}_4 + 2\text{CO}$. The theory of a background reaction followed by a main reaction dispenses with the conception of a unimol. reaction and also with that of free radicals to account for the thermal decomp. of simple org. compounds; only simple bimol. processes are involved. L. S. T.

Influence of inert gases on the inflammation of diethyl ether. J. BARON and P. LAFFITTE (Bull. Soc. chim., 1937, [v], 4, 1271–1276).—The temp. of spontaneous inflammation of 14–175 mm. of $\text{Et}_2\text{O}-\text{O}_2$ mixtures, in which $P_{\text{O}_2}/P_{\text{Et}_2\text{O}}$ was 0.5–6.0, were depressed similarly by adding N_2 and CO_2 (cf. this vol., 247). J. G. A. G.

Influence of pressure on the velocity and direction of decomposition of ethane.—See A., II, 361.

Measurement of a reaction rate at equilibrium by means of a radioactive indicator. Reaction between arsenic acid and iodine. J. N. WILSON and R. G. DICKINSON (J. Amer. Chem. Soc., 1937, 59, 1358–1361).—Radioactive As^{III} does not exchange with non-radioactive As^{V} in dil. acid or alkaline solutions in absence of other easily oxidisable or reducible substances. Exchange occurs at a measurable rate in acid solution in presence of I. Assuming that exchange occurs through oxidation and reduction of I, the rates of oxidation and reduction at equilibrium have been calc. from measurements of rates of exchange in systems containing I' and small amounts of I. The rates agree with kinetic expressions shown to hold for the same reactions remote from equilibrium. E. S. H.

Argentate salts in acid solution. IV. Kinetics of the reduction by water and the formation by ozone of argentic silver in nitric acid solution. A. A. NOYES, C. D. CORYELL, F. STITT, and A. KOSSIAKOFF (J. Amer. Chem. Soc., 1937, 59, 1316–1325; cf. A., 1935, 1088, 1079).—The rate of reduction at 25° is given by $-d[\text{Ag}^{\text{II}}]/dt = k_2[\text{Ag}^{\text{II}}]^2/[\text{Ag}^+]$ + $k_4[\text{Ag}^{\text{II}}]/[\text{Ag}^+]$, where k_2 and k_4 decrease greatly as $[\text{HNO}_3]$ increases. The equation is explained by assuming the occurrence of two independent reduction reactions involving Ag^{III} in equilibrium with Ag^+ and Ag^{II} . The oxidation of aq. AgNO_3 by O_3 has been studied kinetically. The $\text{Ag}(\text{NO}_3)_2$ solutions may be titrated directly with certain reducing agents, using the disappearance of the brown-black colour as the end-point. E. S. H.

Velocity of exchange of solvate molecules as determined by experiments with radioactive halogens. N. E. BRESHNEVA, S. Z. ROGINSKI, and A. I. SCHILINSKI (J. Phys. Chem. Russ., 1937, 9, 296–299).—Fractional pptn. by AgNO_3 of a

mixture of a solution of NaBr in EtOH with a solution of radioactive NaBr in H₂O shows that active Br is pptd. first. From a mixture of NaBr in H₂O and active NaBr in EtOH inactive Br is pptd. first. This shows that Br solvated by H₂O reacts more quickly with Ag than Br solvated by EtOH, and that the exchange of H₂O and EtOH in the solvates of Br is a slow process (requiring several hr.).

E. R.

Kinetics of thermal decomposition of sodium hydrogen sulphide in aqueous solutions. E. A. SOKOLOVA and L. M. LITVINOVA (Ukrain. Chem. J., 1937, 12, 197—211).—The slowness of the reaction of conversion of NaSH into Na₂S is due to hydrolysis of the latter. The reaction is accelerated by adding NaHCO₃ or S, to an extent \propto their concns., but not by starch.

R. T.

Rate of reaction between ions in solution. J. W. BELTON (Proc. Leeds Phil. Soc., 1937, 3, 376—379).—A relation between the reaction velocity between oppositely charged ions, their heats of hydration, and their ionisation potentials is deduced and some supporting evidence is given. N. M. B.

Kinetics of the component reactions in the idealised hydrolysis of sodium bromoacetate. H. M. DAWSON (Proc. Leeds Phil. Soc., 1937, 3, 373—375).—The rates of liberation of Br in four of the six component reactions pass through max. vals. at certain stages. Two have max. at 50%, and the other two at 25%, hydrolysis, and the incidence of these max. is independent of the original concn. and temp.

N. M. B.

Mechanism of elimination reactions. Unimolecular olefine formation from: I. Alkyl halides in sulphur dioxide and formic acid. E. D. HUGHES, C. K. INGOLD, and A. D. SCOTT. II. *sec.*-Octyl halides in aqueous alcohol. A new criterion of mechanism. E. D. HUGHES, C. K. INGOLD, and U. G. SHAPIRO. III. *tert.*-Butyl halides in acid and alkaline aqueous solutions. K. A. COOPER, E. D. HUGHES, and C. K. INGOLD. IV. *tert.*-Amyl halides in acid and alkaline aqueous solutions, and scope of unimolecular mechanism. E. D. HUGHES and B. J. MACNULTY (J.C.S., 1937, 1271—1277, 1277—1280, 1280—1283, 1283—1291).—I. Both CHPhMeCl (I) and Bu^{*t*}Cl, when dissolved in SO₂ or anhyd. HCO₂H, yield mixtures of the original substance in equilibrium with HCl and the corresponding olefine. The reaction is complete in presence of excess of Br. The rate of production of Cl' from (I) in HCO₂H is substantially the same as the rate of racemisation, indicating the identity of the rate-determining process in both changes. There is strong probability that this process is ionisation of the halide giving rise to a radical with a labile proton.

II. Hydrolysis of β -*n*-octyl bromide in aq. EtOH (neutral to acid) is unimol., and is accompanied by 10% olefine formation, also unimol. In 0.8*N*-alkali the reaction is chiefly of second order and consists of substitution and elimination in approx. equal amounts. Rate consts. for the unimol. reactions at 100° have been determined for both the bromide and the chloride.

II * (A., I.)

The ratio (rate of substitution)/(rate of elimination) is approx. the same in both cases, although the total reaction velocity for the bromide is 33 times that for the chloride.

III. Similar results are obtained for Bu^{*t*} halides. From chloride to iodide the individual rates increase by 100-fold, whilst their ratios remain const. to a factor of 1.3.

IV. Similar results are obtained for *tert.*-amyl halides, the rate consts. for which are $>$ for the corresponding Bu^{*t*} halides. Increasing alkylation leads to a preference for the elimination reaction. The substantial constancy of the ratio of the individual rate const. for a given alkyl group, observed in all these experiments, supports the hypothesis that the division of the reaction between substitution and elimination occurs after separation of the alkyl group from the halogen atom. Further cases of unimol. elimination are cited.

F. L. U.

Mechanism of substitution at a saturated carbon atom. VII. Hydrolysis of *isopropyl* halides. E. D. HUGHES and U. G. SHAPIRO. VIII. Hydrolysis of *tert.*-butyl halides. K. A. COOPER and E. D. HUGHES. IX. Role of the solvent in the first-order hydrolysis of alkyl halides. L. C. BATEMAN and E. D. HUGHES. X. Hydrolysis of β -*n*-octyl bromide. E. D. HUGHES and U. G. SHAPIRO (J.C.S., 1937, 1177—1183, 1183—1187, 1187—1192, 1192—1196; cf. A., 1936, 433).—VII. The velocity of hydrolysis (*v*) of Pr^{*t*}Cl and Pr^{*t*}I by OH' has been determined in 60 and 80 vol.-% EtOH. In each case simultaneous *S_N2*, *S_N1*, and *E2* reactions occur. For all reactions the difference in *v* between Pr^{*t*}Cl and Pr^{*t*}Br is that between Pr^{*t*}Br and Pr^{*t*}I. This is attributed to joint dependence of *v* on the C-halogen bond strength and halogen polarisability, and is reflected by the difference in the parameter *E* in the Arrhenius equation. The difference in *v* between the *S_N2* reaction for Pr^{*t*} halides and the total reaction (largely *S_N2*) for Et halides (A., 1933, 470) appears mainly as a difference in the factor *B*.

VIII. The hydrolysis of Bu^{*t*} halides in aq. EtOH is of the type *S_N1*. *v* is about 10⁴ times the val. for Pr^{*t*} halides, due mainly to variation in the factor *B* of the Arrhenius equation, the magnitude of which indicates "normal" and "slow" unimol. reactions, respectively. Hydrolysis of Bu^{*t*} halides becomes "slow" in 95% COMe₂. The spacing of the rates of reaction in this series of halides is similar to that for Pr^{*t*} halides. The results are discussed in relation to recent theories of reaction kinetics in solution.

IX. In the hydrolysis of alkyl halides in aq. media, mechanisms *S_N1* and *S_N2*, both of which follow equations of a first-order reaction, can be distinguished by using as solvent which has an ionising power towards the alkyl halide \ll that of H₂O, under which conditions the ionising effect of small additions of H₂O is eliminated. Measurements of the hydrolysis of Bu^{*t*}Cl at 15° in HCO₂H containing varying quantities of H₂O indicate that the mechanism is *S_N1*, in accord with other data.

X. The alkaline hydrolysis of β -*n*-C₈H₁₇Br comprises the same series of reactions as that of Pr^{*t*} halides, but *v* for *S_N1* and *E2* are $>$, and *v* for *S_N2*

about the same as, for $\text{Pr}^{\beta}\text{Br}$. This effect may be due to steric hindrance or to a tautomeric displacement of the electrons of CH groups, which diminishes as the H atoms are replaced. J. W. S.

Chemical kinetics of the interaction of the alkyl iodides with sodium eugenoxide in ethyl alcohol. S. S. WOOLF (J.C.S., 1937, 1172—1177).—The reaction of Na eugenoxide (I) with MeI, EtI, $\text{Pr}^{\beta}\text{I}$, $\text{Pr}^{\alpha}\text{I}$, $\text{Bu}^{\alpha}\text{I}$, $\text{Bu}^{\beta}\text{I}$, *n*- and *iso*- $\text{C}_5\text{H}_{11}\text{I}$ in abs. EtOH is bimol., but the coeffs. for any temp. increase with increasing dilution. The apparent degree of ionisation of (I) in EtOH has been determined from conductivity measurements at 20°, 35°, and 50°. Application of the theory of dual catalysis to the observed velocity coeffs. shows that the reaction is due almost entirely to interaction of eugenoxide ions. The velocity coeffs. for the ionic reactions are independent of initial concn. in equiv. reactions. The temp. coeff. and the Arrhenius crit. increment of the reactions are calc. From the aspect of the collision theory the reactions are "normal" in type, the factor *P* in the equation $k = PZe^{-E/RT}$ being of the order of unity. J. W. S.

Application of affinity to coupled biochemical reactions. P. VAN RYSELBERGHE (Bull Acad. roy. Belg., 1937, [v], 23, 416—428; cf. this vol., 246).—Mathematical. De Donder's theory of affinity is adapted and illustrated by calculations for the following coupled reactions under various biological conditions: synthesis of carbohydrates by the combustion of H_2 , reduction of NO_3^- to NH_4^+ by combustion of glucose, and synthesis of $\text{CO}(\text{NH}_2)_2$ by combustion of glucose and other substances in fatty tissues. Mechanism and heats of reaction are discussed. N. M. B.

Velocity of dissolution of sodium silicates in water under pressure. S. K. TSCHIRKOV, A. I. KINIAR, and N. S. FEDOTOVA (J. Chem. Ind. Russ., 1937, 14, 369—373).—The velocity of dissolution of Na silicates of different SiO_2 contents and at various temp. has been determined. The solubility falls rapidly with increasing content of Mg, Ca, Al, and Fe oxides. R. T.

Velocity of absorption of carbon dioxide by ammonia-salt solutions. A. P. BELOPOLSKI, I. M. BOGUSLAVSKI, and V. V. URUSOV (J. Chem. Ind. Russ., 1937, 14, 1—9, 164—170).—The initial velocity of absorption, *V*, of CO_2 by aq. NH_3 -NaCl is equal to that by NH_3 - Na_2SO_4 , but is less for the latter solutions during the stage of pptn. of NaHCO_3 . *V* is independent of the initial $[\text{NH}_3]$, and is $\propto [\text{CO}_2]$ of the gas, for solutions of the same degree of carbonation; for a given $[\text{HCO}_3^-]$ it is $\propto [\text{NH}_3]$. *V* falls rapidly during the initial stage, to a min. at the moment of saturation with NaHCO_3 , after which *V* is \propto rate of crystallisation of NaHCO_3 ; during this stage the optimum temp. is 45°, whilst after pptn. of most of the NaHCO_3 it is 30°. R. T.

Preparation and density of aqueous hydrogen sulphide, and the velocity of dissolution of hydrogen sulphide in water. J. STALONY-DOBZANSKI (Rocz. Chem., 1937, 17, 353—362).—The rate of absorption, *V*, of H_2S by H_2O is due to the lower *d*

of the solution (d^{20} 0.99994), as a result of which a saturated surface layer forms, preventing further diffusion. For this reason *V* for CO_2 is 4 times as great as that for H_2S , in spite of the higher solubility of the latter. *V* for H_2S rises rapidly with rise in temp., owing to formation of convection currents. R. T.

Velocity of dissolution of comminuted substances. IV. Determination of the most commonly encountered values of the coefficient ξ . V. Application of the simplified kinetic equation to substances readily soluble in water. W. JACEK (Rocz. Chem., 1937, 17, 293—300, 301—308).—IV. The val. of the coeff. ξ in the equation previously derived (this vol., 250) is found empirically to be 1.35 for irregular fragments obtained by crushing larger crystals of NaCl, and 1.15 for similar fragments with rounded corners.

V. The vals. of ξ found for NaCl apply also to KCl. R. T.

Rate of dehydration of manganous oxalate dihydrate. M. VOLMER and G. SEYDEL (Z. physikal. Chem., 1937, 179, 153—171).—Topley and Smith's experimental results (A., 1935, 588) have been confirmed, but their explanation is criticised. The form of the graph of velocity against pressure of H_2O vapour, *p*, is attributed to the variation, revealed by heat of hydration measurements, in the structure of the product with *p*. X-Ray investigation shows that dehydration in a high vac. yields a practically amorphous product, whereas for *p* = 0.7 mm. the product has the lattice of the anhydride. R. C.

Kinetics of polymeric aldehydes. V. Formation of polyoxymethylene dihydrates having a single chain length and their characterisation by their dissolution velocity constants. J. LOBERING and K. P. JUNG (Monatsh., 1937, 70, 281—296).—Polyoxymethylenes of different degrees of polymerisation may be characterised by their rate of dissolution. Products the rate of dissolution of which is diminished by drying are mixtures of different polymerides and the drying process causes partial fractionation. By polymerisation of CH_2O solutions under suitable conditions products the rate of dissolution of which is const. and reproducible can be obtained. These consist essentially of a single polymeride. The effects of temp., concn., and catalysts on the degree of polymerisation have been studied and are interpreted by a theory of the polymerisation process. F. J. G.

Passivity of iron and steel in nitric acid solution. XVII. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 383—396; cf. this vol., 415).—The electrochemical dissolution of Fe in HNO_3 increased with rise in temp. and the passivation was retarded. The decomp. voltage of HNO_3 decreased with rise in temp., and the ability of HNO_3 to render Fe passive increased with decreasing voltage, a min. occurring in the voltage to make Fe passive at 30°. Fe in 41% HNO_3 became passive at 30°, but not at 20° and 40°. R. S. B.

Inhibitions of organic decompositions by nitric oxide. H. W. THOMPSON and M. MEISSNER

(Nature, 1937, **139**, 1018—1019).—Changes in the absorption spectrum of a reacting mixture of NO and Me_2O show that as the reaction proceeds the NO bands weaken and are replaced with increasing intensity by those of NH_3 . The stage at which NO disappears agrees with that expected from kinetic measurements, indicating that whatever the primary stage in the interaction of radicals with the NO may be, a final product, which does not affect the reaction rate, is NH_3 . $\text{CH}_2\text{N}\cdot\text{OH}$ may be an intermediate product and the condensation by liquid air of a blue product from the reaction mixture may indicate an unstable NO-compound. With Et_2O , the NO bands are gradually replaced by a continuum and feeble, diffuse bands indicative of the presence of NH_2Me . L. S. T.

Effect of iodine on the rate of decomposition of ethylene oxide. R. F. FAULL and G. K. ROLLEFSON (J. Amer. Chem. Soc., 1937, **59**, 1361—1363).—The decomp. of $(\text{CH}_2)_2\text{O}$ into CH_4 and CO at temp. $>350^\circ$ is catalysed by I. For most of the reaction the rate is const. and determined by $[\text{I}]^2$. The results are in agreement with the theory of compensating reactions (cf. this vol., 314). E. S. H.

Mechanism of hydrogen ion catalysis. K. F. BONHOEFFER and O. REITZ (Z. physikal. Chem., 1937, **179**, 135—147).—The maintenance of equilibrium between the catalyst, the substrate, and an additive complex of the two despite the further reaction of the complex is possible, not only in sp. H ion catalysis, but in acid catalysis generally. It may be tentatively assumed that in reactions which proceed more rapidly in D_2O than in H_2O equilibrium is maintained, whilst in reactions which are slower in D_2O it is not. Application of the current theory of H binding accounts for the mutarotation of glucose being the sole example of an H ion catalysis which is slower in D_2O than in H_2O . R. C.

Acid and base catalysis in light and heavy water. Bromination of acetone catalysed by hydrogen ions. O. REITZ (Z. physikal. Chem., 1937, **179**, 119—134).—In D_2O — H_2O mixtures at 25° the rate of enolisation, k , of COMe_2 and $\text{CO}(\text{CD}_3)_2$, as measured by the rate of bromination, increases with the D_2O content of the solvent, c , but more slowly at lower than at higher vals. of c . For $\text{CO}(\text{CD}_3)_2$ in D_2O in presence of D_3O^+ ions k is 2.1 times as great as for COMe_2 in H_2O in presence of H_3O^+ ions, suggesting that the equilibrium concn. of the complex formed by union of the catalyst with the O of the ketone is in $\text{D}_2\text{O} >$ in H_2O . For a given c , $\text{CO}(\text{CD}_3)_2$ is enolised 7.7 times less rapidly than COMe_2 , a deuteron being released from C less readily than a proton. For COMe_2 in equilibrium with the solvent the observed val. of k agrees with the val. calc. by assuming that the readiness with which a proton is released from a Me group is not affected by the presence of some D atoms in the group. The rate of bromination of COMe_2 is equal to the rate at which, under similar conditions, the first H is exchanged for D, suggesting that exchange occurs through the enol form. R. C.

Influence of the carrier on catalysts. I. E. ADADUROV (J. Gen. Chem. Russ., 1937, **7**, 1321—

1327).—Polemical, in reply to Ivannikov (this vol., 143). R. T.

Reaction of oxygen with hydrogen at a palladium surface. I, II. T. TUCHOLSKI (Rocz. Chem., 1937, **17**, 284—292, 340—348).—I. The reaction between H_2 and O_2 at a Pd surface is of zero order at 0 — $160^\circ/10$ — 15 mm., but becomes of higher orders at higher temp. When H_2 is introduced before O_2 the velocity of reaction is initially high, but then rapidly falls to a const. level, determined by the concn. of the substrates. When H_2 — O_2 mixtures are introduced the reaction is accelerated by excess of O_2 , and retarded by excess of H_2 .

II. The ratio of the velocity of reaction of H_2 to that of D_2 at a Pd surface falls from 2 : 1 at 0 — $100^\circ/10$ mm. to 1 : 1 at 270° . The energy of activation of H_2 and D_2 is 4.4 and 4.3 kg.-cal. per g.-mol., respectively, and is approx. equal to that of the velocity of diffusion in Pd. It is concluded that the velocity of reaction \propto the rate of diffusion of H_2 or D_2 through Pd. R. T.

Chlorination in presence of catalysts. E. I. KRETSCH (J. Gen. Chem. Russ., 1937, **7**, 1249—1263).—The view is expressed that certain substances (C, SiO_2) act as chlorination catalysts, by forming unstable chlorides which readily eliminate active Cl. R. T.

Fine structural changes in metallic solid solutions and their influence on the properties of these alloys as catalysts. G. RIENACKER (Metallwirts., 1937, **16**, 633—634).—Recent work has shown that the catalytic effect of alloys with an ordered structure is $<$ that of alloys with a disordered structure. C. E. H.

Oxidation of chromous to chromic sulphate. B. B. KNAPP and J. H. WALTON (J. Physical Chem., 1937, **41**, 679—686).—The autoxidation of CrSO_4 is catalysed slightly by finely-divided Ag and by H^+ , greatly by $\text{Ag} + \text{H}^+$. Unlike the autoxidation of SnCl_2 (cf. A., 1933, 232), inhibition is not caused by org. substances. Induced oxidation of only SnCl_2 is caused by autoxidation of CrSO_4 . F. R. G.

Catalytic interaction of heavy hydrogen and benzene on platinum. A. FARKAS and L. FARKAS (Trans. Faraday Soc., 1937, **33**, 827—837).—Two simultaneous reactions take place in the gaseous phase, hydrogenation of C_6H_6 and exchange of H atoms. The rate of hydrogenation \propto H_2 pressure and is independent of C_6H_6 pressure, and the rate of exchange, corr. for variations in H_2 pressure due to hydrogenation, is independent of the H_2 pressure and approx. \propto the 0.4 power of the C_6H_6 pressure. The apparent heats of activation for the two reactions are respectively 7 and 9 kg.-cal. The rates of both reactions in the liquid phase are $<$ in the gaseous phase. In the liquid phase the catalyst is covered with a C_6H_6 film which displaces H_2 and reduces the reaction rate. The data are discussed with reference to the rate of conversion of para-H. C. R. H.

Mechanism of hydrogenation reactions and the formation of stereochemical isomers. A. FARKAS and L. FARKAS (Trans. Faraday Soc., 1937, **33**, 837—844).—It is suggested that both H atoms of a H_2 mol. are simultaneously added during catalytic

hydrogenation of unsaturated compounds, in contrast to addition of nascent H which involves consecutive addition of two H atoms. Acetylenic, *cis*- and *trans*-ethylenic compounds should yield *cis*-ethylenic, *meso*- and racemic derivatives respectively on hydrogenation, and should yield the stable stereoisomerides, usually *trans*-ethylenic and *meso*-derivatives, on taking up nascent H. A review of published data supports this view. A parallel is drawn between the stereoisomerides formed by addition of nascent H and halogens to double linkings. C. R. H.

Effect of a high-tension electrical discharge on contact catalytic reactions. II. Reduction of nitrobenzene. I. SETO and M. OZAKI (J. Soc. Chem. Ind. Japan, 1937, 40, 190B; cf. B., 1935, 559).—PhNO₂ is reduced with H₂ in presence of Ni on kieselguhr. The liquid is mixed with paraffin to increase its electric resistance. Application of a static discharge of up to 28,000 volts had a marked accelerating effect on the reaction. The effect is a function of the voltage, not of the discharge current. C. I.

Velocity of catalytic hydrogenations. IV. A. KAILAN and F. HARTEL (Monatsh., 1937, 70, 329—373).—The influence of the conditions on the velocity of hydrogenation of CHPh·CH·CO₂H and C₁₇H₃₃·CO₂H and their esters has been investigated. With increasing % of catalysts the velocity increases to a max. and then falls. The position of the max. is different with different catalysts. The unimol. "constants" vary approx. as the square of the pressure of H₂. With rising temp. the velocity rises rapidly from 100° to 120° and then slowly to a max. at 180—200°. The efficiency of the catalyst is the greater the higher is the temp. at which it was reduced. The more efficient is the catalyst, the greater is the amount of H₂ it adsorbs. Esters having an even no. of C atoms are more rapidly hydrogenated than those having an odd no. F. J. G.

Organic catalysts. XVII. Hydration of crotanaldehyde to aldol.—See A., II, 368.

Contact sulphuric acid manufacture. V—VII.—See B., 1937, 776.

Contact activity of chromium oxide in oxidation of sulphur dioxide to sulphur trioxide.—See B., 1937, 778.

Catalytic oxidation of hydrogen sulphide in presence of active charcoal.—See B., 1937, 778.

[Catalytic] reaction between methane and water vapour.—See B., 1937, 746.

Ammonia and methyl alcohol catalysts.—See B., 1937, 777.

[Catalytic] synthesis of methyl alcohol and higher alcohols from water-gas.—See B., 1937, 756.

Electrolytic deposition of silver from non-aqueous solutions containing aluminium bromide. V. A. PLOTNIKOV, D. P. ZOSIMOVITSCH, and E. I. KIRTSCHENKO (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 15—27).—A fine cryst. deposit of Ag can be obtained by electrolysis of solutions of AgCl or AgBr in PhMe or xylene containing AlBr₃. Working details are given. F. J. G.

Electrolytic and chemical exchange methods for the separation of the lithium isotopes. T. I. TAYLOR and H. C. UREY (J. Chem. Physics, 1937, 5, 597—598).—Electrolysis of aq. LiOH until the Li in solution is reduced by a factor of 600 raises the isotopic ratio ⁷Li : ⁶Li from 12.5 to 14.2, indicating a process fractionation factor of 1.020, in accord with the val. of Lewis and Macdonald (this vol., 106). Extraction of LiBr from H₂O by methylamyl alcohol, or *vice versa*, gave no isotope separation. Slow passage of aq. LiCl through a 35-ft. column of zeolite raised the isotope ratio from 11.6 to 13.3. The passage of NH₄Cl through a similar column increased the ratio of ¹⁴N¹⁴N : ¹⁴N¹⁵N in the N₂ produced from it from 124 to 137. Hence the lighter isotope of Li and the heavier isotope of N are preferentially absorbed. J. W. S.

Electrodeposition of manganese from aqueous solutions. I, II.—See B., 1937, 798.

Electrochemical protection of iron from corrosion by alkalis.—See B., 1937, 797.

Metals co-deposited with tungsten from the alkaline tungsten plating bath.—See B., 1937, 798.

Chemical reactions in the silent electric discharge. XVI. Reactions between hydrogen and solid inorganic compounds. S. MIYAMOTO (Bull. Chem. Soc. Japan, 1937, 12, 313—315).—K₂CrO₄ and K₂Cr₂O₇ yield KOH, Cr₂O₃, and H₂O. (NH₄)₂CrO₄ and (NH₄)₂Cr₂O₇ yield NH₃, Cr₂O₃, and H₂O. Ca(ClO₃)₂ and NaClO₃ are reduced to the chlorides. BaSO₃ yields BaS and H₂S. Th(NO₃)₃ yields Th(OH)₄. (NH₄)₂S₂O₈ and K₂S₂O₈ yield H₂S and the sulphates. J. G. A. G.

Oxidation of sulphur vapour at low pressures. W. PIEKIELNY (Rocz. Chem., 1937, 17, 367—381).—The chain reaction between S vapour and O₂ can be initiated by a silent electrical discharge only within a certain pressure range, the limits of which widen with increasing temp. (0.93—10 mm. at 55°, and 0.17—120 mm. at 95°). The reaction will not take place at <50° ± 1°, at which temp. it will proceed only at 2.5 ± 0.5 mm.; the shape of the reaction vessel does not affect the results. The velocity of the reaction at 65—95° ∝ [S], but not [O₂], and inversely as the [SO₂] of the gas. The reaction products are SO₂ with about 17% of SO₃. The theoretical aspects of the above observations are discussed. R. T.

Primary photochemical processes in solution. G. K. ROLLEFSON and W. F. LIBBY (J. Chem. Physics, 1937, 5, 569—571).—Under the usual experimental conditions a close analogy between reactions in solution and in the gas phase cannot be explained by a symmetrical retardation of both dissociation and recombination processes by the solvent. It has been shown by the radioactive indicator method that the high efficiency of the photo-dissociation of Cl₂ in CCl₄ is not due to reaction of the Cl atoms with the solvent. J. W. S.

Influence of velocity of decomposition on the quantitative yield of the photolysis of ammonia. W. MUND, G. BRENARD, and L. KAERTKENMEYER (Bull. Soc. chim. Belg., 1937, 46, 211—226).—

Variations in the quantum yield in the photochemical decomp. of NH_3 are considered. A kinetic treatment involving a secondary mechanism agrees with experimental data. Other published work does not appear to be irreconcilable with the view put forward.

W. R. A.

Effect of pressure on the photolysis of ammonia W. MUND and A. VAN TIGGELEN (Bull. Soc. chim. Belg., 1937, 46, 227—230).—The mechanism of Wiig (this vol., 370) for the photolysis of NH_3 is criticised. Kinetic formulæ based on Wiig's mechanism are derived, but they are not in accord with experimental variation of the quantum yield with variation in pressure.

W. R. A.

(A) **Mercury-photosensitised exchange reaction of deuterium and phosphine.** H. W. MELVILLE and J. L. BOLLAND. (B) **Photochemical decomposition and oxidation of trideutero-phosphine.** H. W. MELVILLE, J. L. BOLLAND, and H. L. ROXBURGH (Proc. Roy. Soc., 1937, A, 160, 384—406, 406—423).—(A) The exchange reactions of D with PH_3 and of H with PD_3 have been investigated. Two mechanisms of exchange, one predominant at low and the other at high temp., occur. The bimol. velocity coeff. of the reaction $\text{D} + \text{PH}_3 = \text{PH}_2\text{D} + \text{H}$ is evaluated. An analytical method of measuring the D_2 content of H_2 - D_2 mixtures, requiring 0.015 c.c. of gas at n.t.p., is described.

(B) The quenching radii of PH_3 and PD_3 for excited Hg atoms are evaluated. The mechanism of the decomp. of PH_3 and PD_3 is investigated. A study of the kinetics of oxidation shows that the upper and lower explosion limits of PH_3 and PD_3 are coincident and that the chain reactions proceed with similar velocities.

G. D. P.

Photochemical reduction of ceric ions by water. J. WEISS and D. PORRET (Nature, 1937, 139, 1019—1020).—When irradiated by ultra-violet light from a strong Hg arc, aq. solutions of $\text{Ce}(\text{ClO}_4)_4$ liberate O_2 without appreciable decomp. of ClO_4^- . Owing to the formation of Ce^{IV} , the speed of the reaction decreases as the reaction proceeds; it is unchanged by filtration of the light through 20% HClO_4 solution. The reaction does not occur when $\text{Ce}(\text{SO}_4)_2$ in H_2SO_4 solution is irradiated, owing to the scarcity of free Ce^{IV} . The mechanism proposed is (i) $\text{Ce}^{IV} + h\nu = \text{Ce}^{IV*}$ (excited ion), (ii) $\text{Ce}^{IV*} + \text{H}_2\text{O} = \text{Ce}^{IV} + \text{H}^+ + \text{OH}^-$, (iii) $2\text{OH}^- = \text{H}_2\text{O} + \text{O}$, $2\text{O} = \text{O}_2$ or (iv) $\text{Ce}^{IV} + \text{OH}^- = \text{Ce}^{IV} + \text{OH}^-$. (iv) is responsible for the effect of Ce^{IV} and for the low quantum efficiency.

L. S. T.

Influence of light on the rhythmic precipitation of silver chromate in gelatin. M. KOHN and L. MAINZHAUSEN (Kolloid-Z., 1937, 79, 316—318; cf. A., 1934, 730).—In the absence of Cl^- light has no influence on the rhythmic pptn. of Ag_2CrO_4 in gelatin gels. In presence of 0.00025—0.001N-KCl rhythmic pptn. does not occur in the dark, but in the light rings with a secondary structure are formed. At 0.002N rings are again formed in darkness, but in distinction to those formed in the light they are more diffuse and exhibit no secondary structure.

F. L. U.

Distribution of spectral sensitivity of sensitised silver halide films at low temperatures. G. UNGAR (Z. Physik, 1937, 106, 322—328).—At -180° the long-wave optical sensitivity of all sensitised Ag halide films is reduced. With eosin and pinachrome-violet the red-sensitivity is reduced below the blue, whereas with pinacvanine the red and blue are almost equally desensitised.

L. G. G.

Influence of physical development in the region of solarisation. A. J. REARDON (Physical Rev., 1936, [ii], 49, 196; cf. A., 1935, 1211).—The three methods of physical development described showed no reversals in the region of solarisation for extra fast, undyed, dry Hammer plates. In each case a continuous increase in the density of the latent image showed that in this region there is no decrease in the amount of Ag deposited by the light exposure, and that the prolonged light action does not decrease the amount of Ag already deposited. Solarisation of the latent image may be due to the closing of the fissures in the emulsion.

L. S. T.

Reduction potential and photographic developers; effect of sulphite in developer solutions. R. M. EVANS and W. T. HANSON, jun. (J. Physical Chem., 1937, 41, 509—534).—Oxidation-reduction potential measurements with org. developers, both with and without the addition of Na_2SO_3 , show that the developers are continuously reversible in the same sense as Fe^{II} complex developers. The primary effect of the addition of KBr to a developer is to decrease the p.d. between the developer and the image by an amount = that predicted by the application of the mass law. The primary action of sulphite in a developer solution is that of an acceptor for the oxidised form. This explains its protective properties against atm. O_2 , its preventive action against the formation of staining products of development, and its augmenting action on the max. developable density for a given exposure.

O. J. W.

Photo-decomposition of aldehydes and ketones. R. G. W. NORRISH and C. H. BAMFORD (Nature, 1937, 140, 195—196; cf. this vol., 91).—Results obtained in the photo-decomp. of COMeEt and COEt_2 in 10% liquid paraffin solution are described. The free radicals formed in the photolysis react mainly with mols. of solvent rather than combine together, as they do in the vapour. With COMeEt , the results suggest that the reaction $\text{MeCO} + \text{C}_n\text{H}_{2n+2} \rightarrow \text{MeCHO} + \text{C}_n\text{H}_{2n+1}$ can occur in this solution. Aldehydes differ from ketones in that photo-decomp. occurs in solution at room temp., and the gaseous products are, in the main, the same as those in the gas phase. Independent evidence is furnished for the conclusion that the hydrocarbon is produced from aldehydes mainly in one act, viz., $\text{RCHO} \rightarrow \text{RH} + \text{CO}$.

L. S. T.

Thermal and photochemical decomposition of acetyl peroxide. O. J. WALKER and G. L. E. WILD (J.C.S., 1937, 1132—1136).—The principal products of both the thermal and photochemical decomp. of Ac_2O_2 are CO_2 , CH_4 , and C_2H_6 . CH_4 is the chief hydrocarbon product in each case, but C_2H_6 is produced in greater proportions in the

photochemical reaction. It is inferred that at least two simultaneous or consecutive reactions occur in each case. The similarity of the products with those of electrolysis of acetate solutions cannot be used as evidence for the peroxide mechanism of electrolytic oxidation. The absorption spectrum of Ac_2O_2 is very similar to that of H_2O_2 and contains a continuous absorption band below 2800 Å. J. W. S.

Photochemistry of polyatomic molecules containing alkyl radicals. VI. Photolysis of mercury dimethyl. H. W. THOMPSON and J. W. LINNETT (Trans. Faraday Soc., 1937, 33, 874—880).—Previous investigations (cf. this vol., 255) have been extended to measurements at high temp. and to the determination of the influence of NO. The quantum yield increases with rise in temp. A scheme based on a series of chain-propagating stages is suggested in explanation, and an estimated val. for the energy of activation for the reaction between free radicals and HgMe_2 mols. is 11,000 g.-cal. In presence of NO the reaction at room temp. follows a completely different course, a white solid product being formed, but the quantum efficiency in terms of disappearance of HgMe_2 is still approx. unity. At higher temp. the reaction is even more complex. It is suggested that HgMe_2 reacts with NO to form MeNO which isomerises to $\text{CH}_2\text{N}\cdot\text{OH}$, and that the solid formed is a polymeride of CH_2O . At higher temp. the oxime would decompose into CO and NH_3 . C. R. H.

Photochemistry of reversible reduction-oxidation processes. I. Quantum sensitivity of photochemical reaction between methylene-blue and phenylhydrazinesulphonate in yellow and red light. G. HOLST (Z. physikal. Chem., 1937, 179, 172—194; cf. this vol., 255).—In a solution of p_{H} 3.0 under such conditions that absorption is practically complete and the dark reaction negligible and with the phenylhydrazinesulphonate (BH_2) concn. that of methylene-blue (A) the quantum yields, γ , are 0.11 and 0.14 in light of λ 579 and ~ 667 m μ , respectively. The relation between γ and the reactant concns. is discussed in relation to Bodenstein's theory (A., 1913, ii, 819). The absorption spectra of A , BH_2 , and benzenediazosulphonate have been determined. With decreasing concn. the absorption max. of A shifts towards the red and the band narrows. R. C.

Irradiation of compounds of the ergosterol type.—See A., II, 376.

Photolysis of sodium chloride by X-, β -, and γ -rays. J. HOFFMANN (Z. anorg. Chem., 1937, 233, 184—196).—The action of X-rays and of β - and γ -radiation on NaCl, and the influence of traces of H_2O , have been studied. Rock-salt is discoloured but alkalinity cannot be detected. Powdered NaCl always contains traces of H_2O even when free from Mg. After irradiation strong alkalinity and free Cl_2 can be detected. Free Na can be detected as alkali after irradiation of NaCl dehydrated by fusion in high vac. F. J. G.

Sensitivity variation of X-ray photographic films. W. H. GEORGE (Proc. Physical Soc., 1937, 49, 357—363).—Two films with the sensitive surfaces

in contact were simultaneously exposed to X-rays. Two exposures were made, the films being turned between the exposures so that in the second exposure the radiation passed through the films in the reverse direction. After development by a method devised to ensure abs. uniformity, the dry films were measured with a Moll microphotometer. With films blackened until they transmit about half the incident light, the variations in sensitivity may lead to max. deviations in individual measurements of X-ray intensities of the order of $\pm 6\%$ and $\pm 3\%$ for single- and double-film exposures, respectively. C. R. H.

Kinetics of the colouring of glass by X-rays. C. E. NURNBERGER and R. LIVINGSTON (J. Physical Chem., 1937, 41, 691—697).—An earlier theory (A., 1935, 1469) has been modified in an attempt to fit the experimental results. F. R. G.

Formation of benzene in the radiochemical polymerisation of acetylene. C. ROSENBLUM (J. Physical Chem., 1937, 41, 651; cf. A., 1937, II, 236).—Further manometric measurements show that about 20% of the reacting C_2H_2 yielded C_6H_6 . The diminishing C_6H_6 :cuprene ratio may be due to the succession of polymerisations: $3\text{C}_2\text{H}_2 \rightarrow \text{C}_6\text{H}_6$; $n\text{C}_6\text{H}_6 \rightarrow (\text{C}_6\text{H}_6)_n$. O. J. W.

Reaction between silver permanganate and hydrogen. F. HEIN [with W. DANIEL and H. SCHWEDLER] (Z. anorg. Chem., 1937, 233, 161—177).—The abnormally high oxidising power of AgMnO_4 solutions towards H_2 has been studied. The effect is increased by addition of Ag salts, independently of the anion, and is heterogeneously catalysed by the insol. products of the reaction. Other substances, especially silvered SiO_2 gel, act as contact catalysts. The effect is attributed to the presence of undissociated AgMnO_4 mols. in the solution or adsorbed on the catalysts, and this view is supported by comparison of the oxidising potentials and absorption spectra of AgMnO_4 and KMnO_4 solutions. F. J. G.

Organo-phosphors with inorganic ground-materials. I. Phosphors based on mono-alkaline-earth phosphates and free phosphoric acids. H. CHOMSE (Z. anorg. Chem., 1937, 233, 140—144).—Phosphorescent substances are formed by partial dehydration (best at about 240°) of $\text{M}(\text{H}_2\text{PO}_4)_2$ ($\text{M} = \text{Be, Mg, Sr, or Ba}$) (or mixtures of MO and H_3PO_4) containing traces of certain org. substances. The phosphorescence is greatest when the composition approximates to $\text{MH}_2\text{P}_2\text{O}_7$. When $\text{H}_4\text{P}_2\text{O}_7$ is used the product is phosphorescent without dehydration. Free $\text{H}_4\text{P}_2\text{O}_7$ or H_3PO_4 forms products which are phosphorescent at liquid air temp., whilst HPO_3 forms products which are phosphorescent at room temp. F. J. G.

Basic magnesium chlorocarbonate. (MME.) L. WALTER-LÉVY (Compt. rend., 1937, 204, 1943—1946).—The formation of the compound $\text{MgCl}_2 \cdot 2\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 6\text{H}_2\text{O}$ has been investigated. J. G. A. G.

Brightly fluorescent zinc oxide [obtained] by partial decomposition of the basic carbonate. E. BEUTEL and A. KUTZELNIGG (Monatsh., 1937, 70, 297—301).—Partial decomp. of basic Zn carbonate

gives fluorescent products; the fluorescence is greatest when about 0.11 mol. of ZnO has been formed, and increases when the products are exposed to air.

F. J. G.

Action of bromine on yellow mercuric oxide. M. LEMARCHANDS and P. PIERRON (Compt. rend., 1937, 204, 1946—1948).—The reaction has been investigated under several conditions. Br vapour and HgO yield, finally, HgBr₂ and Hg(BrO₃)₂, HgOBr₂ being an unstable intermediate compound. In CCl₄, HgBr₂ and a little Hg(BrO₃)₂ are produced. HgO and liquid Br with O₂ under pressure afford pure HgBr₂.

J. G. A. G.

Organo-phosphors with inorganic ground-materials. II. Oxygen-sensitive boric acid phosphors. H. CHOMSE (Z. anorg. Chem., 1937, 233, 145—150).—By treating dehydrated H₃BO₃ with certain org. substances dissolved in EtOH, products which become phosphorescent in vac. are obtained. The phosphorescence is destroyed by air or O₂ but not by N₂.

F. J. G.

Precipitation of aluminium basic sulphate by carbamide. H. H. WILLARD and N. K. TANG (J. Amer. Chem. Soc., 1937, 59, 1190—1196).—The characteristics of the ppt. obtained in presence of various anions are described. The proportion of SO₄ in the ppt. increases with decreasing p_H and, to a smaller extent, with increasing [SO₄'] in the solution. The solubility of the basic sulphate is equiv. to 0.2 mg. of Al₂O₃ per litre at p_H 6.5—7.5, but increases at lower or higher p_H . The advantages of CO(NH₂)₂ in avoiding, by its slow decomp. in hot solution, the production of local differences of p_H are discussed.

E. S. H.

Precipitation of basic gallium sulphate by means of carbamide. I. Study of the precipitate produced. H. H. WILLARD and H. C. FOGG (J. Amer. Chem. Soc., 1937, 59, 1197—1199).—The composition of the ppt. varies from Ga(OH₃) at p_H 8.5 to the ratio Ga : SO₄ = 6.35 at p_H 3.26. Digestion in a solution of higher p_H removes SO₄ readily, but the reverse process is slow. Pptn. in 0.02M-(NH₄)₂SO₄ is most complete at a final p_H 4—5.5, when 0.2 mg. of Ga per litre remains in solution.

E. S. H.

Complex fluorides of gallium and the alkali metals. W. PUGH (J.C.S., 1937, 1046—1048).—GaF₃·3H₂O is most easily prepared by dissolving the metal in HNO₃ and evaporating the solution with HF. Addition of the theoretical quantities or excess of alkali fluorides to aq. GaF₃ ppts. the sparingly sol. *Na gallifluoride*, 3NaF·GaF₃ (a fine white powder, stable in air), 3NH₄F·GaF₃ (octahedra, stable in air at room temp., decomposed by warming in moist air), *Li gallifluoride*, 3LiF·GaF₃, *K gallifluoride monohydrate*, 2KF·GaF₃·H₂O (I) (probably monoclinic), *Rb gallifluoride dihydrate*, RbF·GaF₃·2H₂O (II), and *Cs gallifluoride dihydrate*, CsF·GaF₃·2H₂O (III). (I), (II), and (III) are all stable in air at 110° and completely dehydrated at 230°, the product from (I) undergoing no rapid change in air at room temp., whereas that from (II) reabsorbs 1 mol. of H₂O in 2 days and thereafter shows no rapid change, and that from (III) absorbs 1 mol. of H₂O rapidly and then continues to absorb H₂O.

J. W. S.

Titanium. VII. Thermodynamics of chlorination. I. N. GODNEV and A. V. PAMFILOV (J. Gen. Chem. Russ., 1937, 7, 1264—1267).—It is shown, on thermodynamic grounds, that a reaction gas containing 50 vol.-% of TiCl₄ can be obtained by chlorination of TiO₂-C mixtures at 400°. R. T.

Preparation and properties of titanium monoxide. W. DAWIHL and K. SCHROTER (Z. anorg. Chem., 1937, 233, 178—183).—TiO, prepared by strongly heating an intimate mixture of Ti and TiO₂ in a high vac., is a definite compound having a face-centred cubic lattice with a 4.154 Å., d 4.93, m.p. 1750°; it dissolves in dil. acids giving H₂. Data on conductivity and hardness are given.

F. J. G.

Attempts to prepare cerous amide. F. W. BERGSTROM (J. Amer. Chem. Soc., 1937, 59, 1374—1375).—The prep. from KNH₂ and CeI₃ in liquid NH₃ of CeI₃·Ce(NH₂)₃·10NH₃ and CeI₃·Ce(NH)NH₂ is described.

E. S. H.

New oxide of lead. C. HOLTERMANN and P. LAFFITTE (Compt. rend., 1937, 204, 1813—1815).—Pb₇O₁₁ is formed by dissociation of PbO₂ or inter-action of PbCO₃ and O₂ at 365—460° and 200 atm. pressure.

A. J. E. W.

Concentration of ¹⁵N by a chemical exchange reaction. H. C. UREY, M. FOX, J. R. HUFFMAN, and H. G. THODE (J. Amer. Chem. Soc., 1937, 59, 1407—1408).—A 6.5-fold increase in [¹⁵N] has been obtained by an exchange reaction between NH₃ and aq. (NH₄)₂SO₄.

E. S. H.

Preparation and properties of nitrites (NH₄, Li, Na, K, Cu, Ag, Be, Mg, Ca, Sr, Ba, Zn, Cd, Hg, Pb). J. BUREAU (Ann. Chim., 1937, [xi], 8, 5—142).—Methods for the determination of nitrites in presence of nitrates, and for the determination of impurities in nitrites, are discussed. The accuracy of absorption methods for determining gaseous NO and NO₂ has also been investigated for various NO-NO₂ ratios and concns. Absorption in conc. H₂SO₄ is recommended except at high dilutions, for which cases absorption by amine solutions is preferred. The prep. of pure nitrites by interaction between NO and NO₂ and metallic hydroxides or carbonates, and the conditions for avoiding nitrate formation, have been studied. The physical properties of the nitrites have been studied and thermal and other consts. determined. From an examination of nitrite-H₂O and nitrite-nitrate-H₂O systems the existence of the following *hydrates* is indicated. NaNO₂·0.5H₂O; KNO₂·0.5H₂O; LiNO₂·1.5H₂O; Ba(NO₂)₂·H₂O (hexagonal below 40°, rhombic above 40°); Sr(NO₂)₂·4H₂O; Mg(NO₂)₂·9H₂O; Mg(NO₂)₂·6H₂O. The last three compounds have been isolated.

C. R. H.

Amides of nitric, chloric, iodic, and acetic acids. G. BECK (Z. anorg. Chem., 1937, 233, 155—160).—The possibility of compound formation between acid anhydrides and metallic amides and nitrides, as suggested by theoretical considerations (cf. this vol., 464), has been investigated. Ac₂O in CCl₄ with NaNH₂ and Li₃N forms *Na amidoacetate* Na[NH₂·Ac₂O] and *Li nitridoacetate* Li₃[N·2Ac₂O], respectively. I₂O₅ with NaNH₂ in liquid NH₃ forms

Na amidoiodate together with NaIO_3 . NO_2 in CCl_4 with NaNH_2 forms a mixture of *amidonitrite* and *amidonitrate*, $\text{Na}[\text{NH}_2\text{N}_2\text{O}_3]$ and $\text{Na}[\text{NH}_2\text{N}_2\text{O}_5]$, whilst with Li_3N the *nitronitrate* $\text{Li}_3[\text{N}_3\text{N}_2\text{O}_5]$ is formed, NO being evolved. ClO_2 in CCl_4 with NaNH_2 forms the *amido-chlorate*. I_2O_5 and liquid NH_3 give a substance which on warming to room temp. forms N iodide, and this explodes spontaneously. F. J. G.

Ammoniates of ammonium chloride, bromide, and iodide. (Tensimetric studies.) G. SPACU and P. VOICHESCU (Z. anorg. Chem., 1937, 233, 197—200).—Tensimeter curves between -79° and 17.5° show that NH_4Cl and NH_4Br form only *tri-ammoniates* which decompose below -29° , whilst NH_4I forms *penta-, tetra-, tri-, di-, and mono-ammoniates*, all of which decompose below 0° . F. J. G.

Nitrogen compounds of phosphorus. P. RENAUD (Bull. Soc. chim., 1937, [v], 4, 1291—1293; cf. A., 1935, 833).—The facts do not support the views advanced (this vol., 372). J. G. A. G.

Nitrogen compounds of phosphorus. H. MOUREU and G. WETROFF (Bull. Soc. chim., 1937, [v], 4, 1293—1297).—A reply (cf. preceding abstract; A., 1936, 440). J. G. A. G.

Preparation and properties of alkaline-earth arsenates. H. GUÉRIN (Bull. Soc. chim., 1937, [v], 4, 1249—1259).—The normal arsenates pptd. by interaction of CaCl_2 , SrCl_2 and BaCl_2 with sol. arsenates contain 1—3% of Cl . The following pure compounds have been prepared by interaction of aq. As_2O_5 with $\text{Ca}(\text{OH})_2$, $\text{Sr}(\text{OH})_2$, and $\text{Ba}(\text{OH})_2$ under the conditions described: $\text{Ca}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$; $\text{Sr}_3(\text{AsO}_4)_2 \cdot 3\text{H}_2\text{O}$; $\text{Ba}_3(\text{AsO}_4)_2$; $\text{Ca}_2\text{H}_2(\text{AsO}_4)_2 \cdot 4\text{H}_2\text{O}$; $\text{Sr}_2\text{H}_2(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$; $\text{Ba}_2\text{H}_2(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$; $\text{CaH}_4(\text{AsO}_4)_2$; $\text{SrH}_4(\text{AsO}_4)_2$; and $\text{BaH}_4(\text{AsO}_4)_2 \cdot \text{H}_2\text{O}$. The dehydration and solubilities of these salts have been investigated. J. G. A. G.

Chemical nature of iodobismuthic acid and its relationship to the alkali iodide compounds of bismuth iodide. A. E. JURIST and W. G. CHRISTIANSEN (J. Amer. Pharm. Assoc., 1937, 26, 501—504).—Solubility data for BiOI in aq. HI indicate the existence of HBiI_4 and H_2BiI_5 . Na "iodobismuthites" are probably salts of these acids, the Bi being anionic. F. O. H.

Interchange reactions of oxygen. I. Interchange of oxygen between water and potassium phosphate in solution. E. BLUMENTHAL and J. B. M. HERBERT (Trans. Faraday Soc., 1937, 33, 849—852).—Equilibrium in the reaction $\text{K}_3\text{PO}_4 + 4\text{H}_2^{18}\text{O} \rightleftharpoons \text{K}_3\text{P}^{18}\text{O}_4 + \text{H}_2\text{O}$ is established in <3 hr. at room temp., three, and probably four, of the O in K_3PO_4 exchanging with the O of the H_2O . A possible mechanism to account for the data is discussed. C. R. H.

Molybdenum-blues. Amorphous colloidal molybdenum-blue. V. AUGER and (Mlle.) N. IVANOFF (Compt. rend., 1937, 204, 1815—1817).—The blue prepared by Guichard's method (A., 1900, ii, 658) is $\text{Mo}_2\text{O}_5 \cdot 4\text{MoO}_3 \cdot 7\text{H}_2\text{O}$ (I). Other Mo blues consist of (I) containing adsorbed MoO_3 ; the latter can be removed by washing a solution of the blue in

BuOH with very dil. acid. (I) behaves as an ionisable complex in aq. solution. A. J. E. W.

Reducing properties of fuller's earth. E. ERDHEIM (Österr. Chem.-Ztg., 1937, 40, 344—345).—Solutions of $(\text{NH}_4)_2\text{SO}_4 \cdot \text{Fe}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ are reduced when shaken with the earth. E. S. H.

Transformations from $\gamma\text{-FeOOH}$ and $\gamma\text{-Fe}_2\text{O}_3$ to $\alpha\text{-Fe}_2\text{O}_3$ at lower temperatures and the irreversible transition $\gamma\text{-FeOOH}$ to $\alpha\text{-FeOOH}$. L. A. WELO and O. BAUDISCH (Phil. Mag., 1937, [vii], 24, 80—87; cf. this vol., 192).— $\gamma\text{-FeOOH}$ (I) in presence of H_2O in a closed tube is irreversibly transformed at 136° into $\alpha\text{-FeOOH}$, which is dehydrated to $\alpha\text{-Fe}_2\text{O}_3$ at the same temp. $\gamma\text{-Fe}_2\text{O}_3$ undergoes similar transitions, the first stage being hydration to (I). Dry (I) gives $\gamma\text{-Fe}_2\text{O}_3$ at 250° in an open tube; this is irreversibly transformed into $\alpha\text{-Fe}_2\text{O}_3$ at 380° . A. J. E. W.

Complex salts of tervalent cobalt, chromium, and rhodium with racemic and optically-active trans-1:2-diaminocyclohexane. F. M. JAEGER and L. BLJKERK (Z. anorg. Chem., 1937, 233, 97—139).—Complex salts of *trans*-1:2-diaminocyclohexane (Chxn) with Co^{III} , Cr^{III} , and Rh^{III} , and of 1:2-diaminocyclopentane (Cptn) with Cr^{III} , have been prepared and their optical activity studied. Complex salts obtained from the racemic base and CoCl_2 can be resolved by means of *d*-tartaric acid into optically-active components which are identical with the salts obtained from the active forms of the base. Mixed salts such as $[\text{Co}(\text{d-Chxn})(\text{l-Chxn})_2]\text{Cl}_3$ are not formed but give the racemic salt and (e.g.) $[\text{Co}(\text{l-Chxn})_3]\text{Cl}_3$. The only complexes which can exist are $[\text{Co}(\text{l-Chxn})_3]^{\text{II}}$ and $[\text{Co}(\text{d-Chxn})_3]^{\text{III}}$. The curves of $[\alpha]$ against λ are of a characteristic form resembling those for the $[\text{Co}(\text{en})_3]^{\text{III}}$ salts and for salts containing both Chxn and en . Similar relationships are found with Cr^{III} and Rh^{III} salts. *Compounds* l-Chxn , m.p. 42.7° , b.p. $82^\circ/14$ mm., $[\alpha]_D = -36^\circ$; *d-Chxn*, $[\alpha]_D = +34^\circ$; *r-, d- and l-Chxn hydrochloride and nitrate*; *r-, d-, and l-[Co(Chxn)_2Cl_2]Cl*; *r-[Co(Chxn)_3]Cl_3 \cdot H_2O*; *d- and l-[Co(Chxn)_3]Cl_3 \cdot 4H_2O* (also with $3H_2O$); *r-, d-, and l-[Co(Chxn)_3](NO_3)_3 \cdot 3H_2O*; *r-[Co(Chxn)_3](ClO_3)_3 \cdot 3H_2O* (also anhyd.); *r-[Co(Chxn)_3](ClO_4)_3 \cdot 3H_2O*; $[\text{Co}(\text{l-Chxn})_3]_2\text{Cl} \cdot \text{d-C}_4\text{H}_4\text{O}_6 \cdot 2\text{H}_2\text{O}$; $[\text{Co}(\text{d-Chxn})_3]_2\text{Cl} \cdot \text{d-C}_4\text{H}_4\text{O}_6 \cdot 5\text{H}_2\text{O}$; $[\text{Co}(\text{l-Chxn})_3]_2\text{I}_3 \cdot 2\text{H}_2\text{O}$; $[\text{Co}(\text{en})_2(\text{d-Chxn})]\text{Cl}_3 \cdot \text{H}_2\text{O}$; $[\text{Co}(\text{en})(\text{d-Chxn})_2]\text{Cl}_3 \cdot 3.5\text{H}_2\text{O}$; $[\text{Co}(\text{en})_2(\text{r-Chxn})]\text{I}_3 \cdot \text{H}_2\text{O}$; *L-[Cr(d-Chxn)_3]Cl_3 \cdot 3H_2O*; *L-[Cr(d-Cptn)_3]Cl_3 \cdot 3H_2O*; *d- and l-[Rh(Chxn)_3]Cl_3 \cdot 3H_2O*; *L-[Rh(d-Chxn)_3](NO_3)_3 \cdot 3H_2O*; *L-[Rh(d-Chxn)_3](ClO_4)_3 \cdot 2H_2O*; $[\text{Ir}_2(\text{l-Chxn})_3]\text{Cl}_3 \cdot 0.5\text{H}_2\text{O}$. Polarimetric and crystallographic data are given. F. J. G.

Metal-like nickel hydrides. W. BUSSEM and F. GROSS (Metallwirts., 1937, 16, 669—671).— Ni vaporised in vac. or in a normal H_2 atm. has a cubic structure, but when evaporated by moderate heat in the presence of active H it forms the same hydride, with a hexagonal lattice, as has been produced by cathodic disintegration. The essential requirement

for the formation of the hexagonal phase is the presence of active H. C. E. H.

Oxidation of hydroxylamine compounds of platinum. I. I. TSCHERNIAEV and V. I. GOREMIKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 344—346).—The oxidation of *cis*- and *trans*-[Pt, 2NH₃, 2Hx]Cl₂ (Hx = NH₂OH) with Cl₂ has been examined. (NH₄)₂PtCl₆ is obtained, indicating that the migration of NH₃ occurred at the moment of oxidation of the NH₂OH. [Pt, NH₃, Hx, Cl₂] also gave (NH₄)₂PtCl₆, and [Pt, Hx, NH₃, 2C₅H₅N]Cl₂ gave [Pt, 2C₅H₅N, Cl₄] on oxidation. Migration of NH₃ occurs in the *trans*-position to NH₂OH, irrespective of the no. of NH₂OH mols. in the inner zone, or of the type of complex. [Pt, Hx, NH₃, C₅H₅N, Cl]Cl gave NH₄[C₅H₅N, Cl₅, Pt] on oxidation. The NO₂ of [Pt, Hx, (NO₂), C₅H₅N, NH₃]Cl is removed from the inner zone on oxidation, [Pt, C₅H₅N, NH₃, Cl₄] being formed. A. J. M.

Hydroxylamine pyridine compounds of bivalent platinum. I. I. TSCHERNIAEV and V. I. GOREMIKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 341—343).—The stability of NH₂OH-C₅H₅N derivatives of Pt depends on composition, being greater as C₅H₅N is replaced by NH₂OH. The compounds [Pt, Hx, 3C₅H₅N]Cl₂, *cis*-[Pt, 2Hx, 2C₅H₅N]Cl₂, and [Pt, 3Hx, C₅H₅N]Cl₂ (Hx = NH₂OH) are colourless, cryst. substances, sol. in H₂O, EtOH-H₂O, and less readily in EtOH. With K₂PtCl₄ they give *platinichlorides* [Pt, Hx, 3C₅H₅N]PtCl₄, [Pt, 2Hx, 2C₅H₅N]PtCl₄, and [Pt, 3Hx, C₅H₅N]PtCl₄. A. J. M.

Quantitative emission spectrum analysis. I. Relative broadening of lines. F. EISENLOHR and K. ALEXI (Z. physikal. Chem., 1937, 179, 241—255).—A method of quant. analysis is described depending on the fact that if an element is mixed with a suitable material as base the width of its spectral lines increases with its concn. The substance for analysis is conveniently made into a bead with microcosmic salt, serving as base, emission being induced by passing sparks between the bead and a Pt wire, and the width of some line of the element to be determined relative to a suitable line of the base or of an added substance is measured on a photograph of the spectrum. The width of a spectral line on a photograph \propto the logarithm of the time of exposure. R. C.

Evaluation of accuracy of analytical methods. S. M. RAISKI (Zavod. Lab., 1937, 6, 265—269).—Methods are described. R. T.

Analysis of mixtures of volatile acids. M. N. BECHTEREVA and N. D. JERUSALINSKI (Zavod. Lab., 1937, 6, 312—316).—The methods of Virtanen *et al.* (B., 1928, 688) and of Allgeier *et al.* (A., 1929, 1093) are recommended. R. T.

Diphenylguanidine as a standard in neutralisation processes. W. M. THORNTON, jun., and C. L. CHRIST (Ind. Eng. Chem. [Anal.], 1937, 9, 339).—The impure, commercial product is not satisfactory. E. S. H.

Determination of chlorine in silicates. V. M. ZVENIGORODSKAJA and R. G. GOTSCHNER (Zavod.

Lab., 1937, 6, 298—299).—The method previously described (this vol., 324) is applied to determination of Cl in silicates. R. T.

Nephelometric end-point of at. wt. titrations. A. F. SCOTT and F. H. HURLEY, jun. (J. Amer. Chem. Soc., 1937, 59, 1297—1302).—The end-point of equal opalescence is valid at room temp., but not at 0°. The apparent excess of Cl' at 0° is not due to adsorption by the ppt., but to the fact that the opalescences of the suspensions are not strictly \propto [Ag'] and [Cl'] in the solutions. It is suggested that the solubility of AgCl is increased in solutions containing excess of Cl'. The influence of colloidal AgCl on the end-point is discussed. E. S. H.

Determination of iodine in extracts from brine.—See B., 1937, 778.

Determination of iodine [in drugs].—See B., 1937, 839.

Potentiometric titration of fluorides. I. G. RISS and N. G. BAKINA (Zavod. Lab., 1937, 6, 172—177).—Excess of Na₂SiF₆ is added to the solution of fluoride, which is titrated (quinhydrone electrode) with N-Ca(NO₃)₂. SO₄" does not interfere. R. T.

Determination of sulphur dioxide and sulphur trioxide in sulphur burner gases.—See B., 1937, 778.

Determination of sulphur in wool.—See B., 1937, 765.

Rapid determination of sulphur in pyrites cinder.—See B., 1937, 778.

Qualitative test for selenium. I. H. A. LJUNG (Ind. Eng. Chem. [Anal.], 1937, 9, 328—330).—The reduction of SeO₃" to Se by NH₄CNS in presence of HCl serves to detect 1 part of Se in 2—4 \times 10⁷ parts of solution. Interference is caused by Fe⁺⁺, Sb⁺⁺⁺, and Sn⁺⁺, but not by Fe⁺⁺⁺, Mn⁺⁺, Cr⁺⁺⁺, Al⁺⁺⁺, Zn⁺⁺, Ni⁺⁺, Co⁺⁺, Pb⁺⁺, Cu⁺⁺, Bi⁺⁺⁺, Cd⁺⁺, or Hg⁺⁺. E. S. H.

Determination of dissolved nitrogen in water. N. W. RAKESTRAW and V. M. EMMEL (Ind. Eng. Chem. [Anal.], 1937, 9, 344—346).—The H₂O is sprayed repeatedly into an evacuated chamber and the extracted gas removed after each injection. The total quantity of gas is measured manometrically at const. vol., and the content of O₂ and N₂ determined in the same way after reaction with P and Li. Results for sea-H₂O are given. E. S. H.

Xylenol method for determining nitrate-nitrogen and its use in studying the physiology of the sugar-beet. F. WERR (Z. Wirts. Zuckerind., 1937, 87, 119—154).—The following form of the xyleneol method (B., 1929, 370; 1934, 112, 113) is recommended. 0.02—0.5 mg. of NO₃'-N may be determined without preliminary destruction of org. matter. A mixture of 25 c.c. of 75 vol.-% H₂SO₄, 0.1 c.c. of xyleneol, and 5 c.c. of H₂O containing the sample is allowed to react at room temp. for 15 (in some cases 30) min. and is then diluted with 100 c.c. of H₂O; 40—50 c.c. are distilled from it in 15 min. into 25 c.c. of 0.2N-NaOH, the distillate is made up to 100 c.c., and its extinction coeff. determined with the Leifo photometer, using a colour filter transmitting at 460 m μ . The following substances interfere:

H₂O₂, nascent H, halides (>1—2 mg. of KCl), >10 mg. of KMnO₄, and NO₂' (destroyed by means of NaN₃). Reaction times and max. quantities of different kinds of material are specified. J. H. L.

Rapid Kjeldahl method for nitrogen determination.—See B., 1937, 829.

Determination of very small amounts of hydroxylamine, nitrite, and nitrate. G. ENDRES and (FRL.) L. KAUFMANN (Annalen, 1937, 530, 184—194).—0.28—2.8 × 10⁻⁶ g. per 10 c.c. of NO₂' is determined photometrically by the diazo-method with p-NH₂-C₆H₄-SO₃H-AcOH-β-C₁₀H₇-NH₂; Beer's law holds for this range of concn., but more conc. solutions should be diluted. 5 × 10⁻⁶ g. in 10 c.c. give a brown colour due to phenols. NH₂OH is quantitatively converted by I into HNO₂ and HI; the HNO₂ may then be determined as above, the error being ±2—3% for 0.1—0.2 × 10⁻⁶ g. of NH₂OH-N in 10 c.c. NO₂' is determined in <9 : 1 mixtures of NO₂-NH₂OH by the diazo-method; a second aliquot is treated with I and then by the diazo-method, the excess being due to the NH₂OH. For >9 : 1 mixtures the bulk of the NO₂' must be first destroyed by adding the theoretical amount of NaN₃, bringing to p_H 4 by p-NH₂-C₆H₄-SO₃H, and boiling for 3 min., or by adding 0.9 mol. of NaN₃, bringing to p_H 3 by AcOH, and keeping at room temp. for 30 min.; in the latter case the NO₂' remaining undestroyed must be determined. 2—14 × 10⁻⁶ g. of NO₃'-N in 5 c.c. are determined photometrically by the brucine test. Mixtures containing 0.3 × 10⁻⁶ g. NH₂OH-N, 0.3 × 10⁻⁶ g. of NO₂'-N, and 4 × 10⁻⁶ g. of NO₃'-N are analysed by the above methods, 10—20 c.c. being required. Blank tests and cleanliness are required. R. S. C.

Detection of small amounts of boric acid in glass.—See B., 1937, 781.

Determination of lime-solvent carbonic acid in waters.—See B., 1937, 849.

Determination of potassium in ammonia synthesis catalysts.—See B., 1937, 777.

Photo-nephelometric determination of calcium.—See B., 1937, 795.

Rapid determination of calcium and magnesium oxides. P. N. GRIGORIEV (Zavod. Lab., 1937, 6, 238).—Ca is pptd. as oxalate, and Mg as MgHPO₄, from the filtrate from pptn. of sesquioxides. The washed ppt. is dissolved in hot 10% HNO₃, and the Ca and Mg contents are derived from the C₂O₄'' and PO₄''' contents of the solution, determined by the ordinary methods. R. T.

Determination of barium, sulphur, and sulphates. Rapid and accurate volumetric method. S. J. KOCHOR (Ind. Eng. Chem. [Anal.], 1937, 9, 331—333).—Standard analytical procedures have been examined and co-ordinated into a scheme. Examples of determinations of S in coal, rubber, cement, steel, insecticides, etc. are given. E. S. H.

Determination of magnesium in medicines.—See B., 1937, 839.

Determination of small amounts of zinc. L. E. KARLSOR (Zavod. Lab., 1937, 6, 300—302).—Zn (<0.02 mg.) is determined by pptn. with 8-hydroxy-

quinoline (I), by a colorimetric method involving coupling of (I) from the washed ppt. with diazotised sulphanilic acid. Should the material under analysis contain Cu, this is readily separated by Tzinberg's method (*ibid.*, 1935, 4, 1161). R. T.

Separation of zinc from cobalt, nickel, and manganese by means of hydrogen sulphide, and final precipitation of zinc with anthranilic acid. II. E. A. OSTROUMOV (Ann. Chim. Analyt., 1937, [iii], 19, 173—176; cf. this vol., 426).—Zn is pptd. from neutral or slightly acid (AcOH) solution by means of Na anthranilate at room temp. The ppt. is dried at 105—110°. J. S. A.

Determination of minute quantities of lead. P. G. JACKSON (J.S.C.I., 1937, 56, 211—213r).—In the colorimetric determination of Pb as PbS, the colour is deeper in AcOH than in NH₃ solutions; 1—2 ml. of 33% AcOH are best added. Traces of Cu, as also Fe⁺⁺⁺, but not Fe⁺⁺, greatly diminish the colour; in NH₃ solutions the effect is augmented by KCN. Cu and Fe should be completely removed before testing for Pb. Gelatin diminishes the colour in acid solutions, but is advantageous as a stabiliser. For the initial separation of traces of Pb as PbSO₄, the vol. of H₂SO₄ should be >0.125 ml. The method is applicable to the separation of traces of Pb in, e.g., beer, which is first oxidised with HNO₃, 0.5 ml. of 25% H₂SO₄ being added towards the end of the evaporation. J. S. A.

Determination of lead. J. P. HOCHSTEIN (Zavod. Lab., 1937, 6, 269).—Polemical, against Gaptchenko and Scheintzis (*ibid.*, 1935, 4, 868, 1014). R. T.

Bromopotentiometric titration of thallium with chloroamine. C. DEL FRESNO and A. AGUADO (Z. anal. Chem., 1937, 109, 334—338).—Tl⁺ is oxidised to Tl⁺⁺⁺ in acid solutions by NH₂Cl in the presence of KBr. For potentiometric titrations, NH₂Cl is used in 1.4% aq. solution. J. S. A.

Specific determination and separation of thallium with thionalide [thioglycollic β-amino-naphthylamide]. R. BERG and E. S. FAHRENKAMP (Z. anal. Chem., 1937, 109, 305—315).—Tl is pptd. by thionalide (I) (used as conc. solution in COMe₂) from cold solutions which are N in free NaOH, in the presence of 2 g. of Na tartrate and 3—5 g. of KCN per 100 c.c. The ppt. is coagulated by heating, and separated from the cooled solution. V, Fe⁺⁺⁺, Pt^{IV}, Pd^{IV}, and Au^{III} are reduced with NH₂OH before adding (I). In presence of Cd, the [KCN] is doubled; in presence of UO₂⁺⁺, (NH₄)₂CO₃ is added to dissolve any pptd. Na uranate. Hg, Bi, and Pb are partly pptd. with the Tl, but copptn. is avoided by using a 10-fold excess of (I) in sufficient COMe₂ to make the final [COMe₂] 30%. In the presence of Ca, Sr, Ba, or Mg, the solution is made alkaline with aq. NH₃. The Tl-(I) ppt. may be determined gravimetrically after drying at 100°, or may be dissolved in AcOH + H₂SO₄, and oxidised with 0.02N-I, followed by back titration with Na₂S₂O₃. J. S. A.

Volumetric determination of copper and nickel present together. RASCHUTIN (Maslob. Shir. Delo, 1937, No. 2, 24).—Ni and Cu are deter-

mined cyanometrically in one portion of solution, and Cu alone iodometrically in a second portion. R. T.

Determination of copper in metallic nickel.—See B., 1937, 795.

Standardisation of ceric sulphate with potassium iodide by the acetone method. D. LEWIS (J. Amer. Chem. Soc., 1937, 59, 1401).—The titre varies with the acid concn. Within the range 0.9—2.7*N*-H₂SO₄ the results are accurate to 0.1%.

E. S. H.

Volumetric determination of cerium in rare earth oxide mixtures. V. G. SCHTSCHERBAKOV (Zavod. Lab., 1937, 6, 160—161).—0.25—0.3 g. of oxides is heated with 50 ml. of 50% H₂SO₄ and 2 ml. of 3% H₂O₂, to evolution of SO₃, and the solution is poured into 100 ml. of H₂O, with cooling. The solution is made neutral with aq. NH₃, H₂SO₄ is added to 1%, and the solution is boiled with 1 g. of (NH₄)₂S₂O₈ (I) for 2 min., cooled to 50°, again boiled with 1 g. of (I), again cooled, and once more boiled with 2 g. of (I) and 20 ml. of 20% H₂SO₄ for 30 min., to decompose excess of (I). 0.1*N*-H₂O₂ is added to the cooled solution, and excess of H₂O₂ is titrated with 0.1*N*-KMnO₄ (1 ml. = 14.025 mg. Ce).

R. T.

Potentiometric titration of cerium, lanthanum, and thorium, as ferrocyanides. F. M. SCHEMJAKIN and V. A. VOLKOVA (J. Gen. Chem. Russ., 1937, 7, 1328—1332).—Sharp end-points are obtained in the titration of Ce^{III}, Th^{IV}, or La^{III} by K₄Fe(CN)₆; when these are present together their sum, but not the individual salts, may be determined. Ce^{III} may be determined in presence of Th and La by titration with K₄Fe(CN)₆.

R. T.

Reactions of rare earths and allied elements with pyrogallol, gallic acid, and morphine. V. F. M. SCHEMJAKIN (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 347—350).—The reactions of nitrates of Pr, Er, Y, and a mixture of Pr and Nd with an ammoniacal solution of gallic acid (I) and with pyrogallol (II) are described. The presence of Ti, Nb, and Ta inhibits the reaction of Ce with (I) and (II). The action of morphine hydrochloride on salts of Pr, a mixture of Pr and Nd, Er, Y, Ti, Zr, and K₂NbF₇, and K₂TaF₇, has been examined.

A. J. M.

Determination of aluminium in nitrate solution by potentiometric titration with an antimony electrode. K. L. MADSHAGALADZE (Zavod. Lab., 1937, 6, 305—308).—Al(NO₃)₃ and free HNO₃ may be determined by electro-titration (Sb electrode). Should > traces of Fe be present no sharp breaks in the potential curve are obtained until titration of Al + Fe + HNO₃ is completed.

R. T.

Determination of aluminium by titration with alkali. A. E. MARTIN (J.S.C.I., 1937, 56, 179—180r).—Al in slightly acid solution is titrated with alkali either by using a simple electrometric method or with indicators. The *p*_H remains practically const. during the pptn. of Al(OH)₃ and it is only necessary to recognise the rapid changes of *p*_H which occur for small additions of alkali before and after the pptn. Bromophenol-blue is used before pptn. (*p*_H 3.7) and Me-red (in addition) afterwards (*p*_H 6.0). A. E. M.

Effect of anions on the titration of aluminium chloride. T. H. WHITEHEAD, J. P. CLAY, and C. R. HAWTHORNE (J. Amer. Chem. Soc., 1937, 59, 1349—1350).—In the potentiometric titration of AlCl₃ with NaOH a low result is obtained in presence of many anions. The order of their effect is: citrate > C₂O₄²⁻ > tartrate > succinate > SO₄²⁻ > OAc⁻ > NO₃⁻. Na⁺, K⁺, and NH₄⁺ have relatively little effect on the titration.

E. S. H.

Determination of aluminium in presence of iron.—See B., 1937, 797.

Resorcyldoxime as a reagent for the colorimetric determination of ferric iron. S. L. CHIEN and T. M. SHIH (J. Chinese Chem. Soc., 1937, 5, 154—161).—1 c.c. of 0.2% resorcyldoxime (I) in 5% EtOH-H₂O gives a purple colour with 50 ml. of a slightly acid solution containing > 0.3 p.p.m. of Fe^{III}. The colour fades only very slowly and 0.3—5 p.p.m. of Fe^{III} can be determined colorimetrically in the presence of small quantities of a large no. of ions. Hg^{II}, Au^{III}, Pd^{II}, Mo, UO₂²⁺, Sb^{III}, Sn^{IV}, and especially Ti^{IV}, strong acidity or alkalinity interfere. Cu^{II} is quantitatively pptd. by the reagent (cf. A., 1932, 160), but the ppt. is unsuitable for gravimetric work.

J. G. A. G.

2:4-Dihydroxyacetophenone as a qualitative reagent for ferric iron. S. R. COOPER (Ind. Eng. Chem. [Anal.], 1937, 9, 334—335).—The reagent in EtOH serves to detect 2 p.p.m. Fe^{III} in solution by means of the red colour produced. Co, Cu, Ni, Mn, Hg, Al, and Cr salts interfere when present in large excess; oxalates, tartrates, and citrates also interfere. PO₄³⁻ must be absent.

E. S. H.

Quantitative separation of ferric, aluminium, and chromic ions from the ions of the ammonium sulphide group. G. CHARLOT (Bull. Soc. chim., 1937, [v], 4, 1235—1244).—The solubilities of Fe^{III} and Al^{III} at *p*_H 5.4 are < 0.1 mg. and < 1.0 mg. per 100 c.c., respectively. By adjusting the slightly acid solutions to *p*_H 5.4 by means of (CH₂)₆N₄-HCl buffer solution [400 g. of (CH₂)₆N₄ + 1000 c.c. of H₂O + 100 c.c. of 12*N*-HCl], the following separations are effected in the cold (cf. A., 1933, 1133): Fe-Zn; Fe, Al-Ca, Mg; Al-Ce; Fe, Al-Co; Fe-Ni; Fe, Al-Mn; and, with double pptn., Al-Zn; Al-Ni; Fe-Ce. With a large proportion of Fe relative to Cr, some Cr is co-pptd. with the Fe, whilst with excess of Cr, Fe is retained in solution.

J. G. A. G.

Quantitative separation of aluminium and ferric ions from calcium ions in presence of phosphoric ions. G. CHARLOT (Bull. Soc. chim., 1937, [v], 4, 1244—1246).—Al and Fe hydroxides and phosphates are pptd. at *p*_H 5.4 by means of (CH₂)₆N₄-HCl buffer solution and NH₄Cl, whilst Ca^{II} and any excess of PO₄³⁻ remain in solution. Double pptn. is necessary with excess of PO₄³⁻, and the solubility of Al^{III} is 1 mg. per 100 c.c.

J. G. A. G.

Qualitative analysis [of the ions] of the ammonium sulphide group in the presence of PO₄³⁻ ions. G. CHARLOT (Bull. Soc. chim., 1937, [v], 4, 1247—1248).—PO₄³⁻, Al^{III}, Fe^{III}, and Cr^{III} are pptd. in the presence of excess of Fe^{III} by adjusting the *p*_H to 5.4 with (CH₂)₆N₄-HCl buffer solution. Zn^{II}, Ni^{II}, and

Co⁺⁺ are pptd. from the filtrate by H₂S. The Mn⁺⁺ is then pptd., after removing the H₂S, by aq. NH₃ and H₂O₂. J. G. A. G.

Accuracy of potentiometric titration in the oxidation-reduction reaction between bivalent iron and potassium dichromate. N. J. CHLOPIN (Zavod. Lab., 1937, 6, 227—229).—More accurate results are obtained with electro-titration of Cr₂O₇⁼⁼ than with other methods; the error is least when the result is taken as the mean of direct titration with standard Fe^{II}, and of back-titration of excess of Fe^{II} with standard K₂Cr₂O₇. R. T.

[Use of perchloric acid in steel analysis.]—See B., 1937, 793.

Rapid determination of cobalt in steel.—See B., 1937, 793.

Colorimetric determination of cobalt in metallic nickel.—See B., 1937, 795.

Volumetric determination of nickel. N. S. KRUPENIO (Zavod. Lab., 1937, 6, 239).—Ni is pptd. with methylglyoxime, and the ppt. is dissolved in 0.1N-HCl, excess of which is titrated with 0.1N-NaOH; the Ni content is hence calc. R. T.

Drop method of detection of chromium. T. P. LEXASCHOVA (Zavod. Lab., 1937, 6, 369).—2—3 drops of 1:1:1 H₂SO₄-HNO₃-H₂O are placed on the cleaned metal surface, transferred to a watch-glass, and heated with excess of Na₂O₂. The suspension is placed on a folded filter-paper, and a drop each of benzidine in AcOH and of aq. H₂O₂ are placed on the spot forming on the lower sheet; a blue coloration indicates Cr. R. T.

Colorimetric determination of tungsten and molybdenum. F. A. FERJANTSCHITSCH (Zavod. Lab., 1937, 6, 289—292).—In absence of Mo or Sb, colorimetric determination of W may be effected using TiCl₃ in place of SnCl₂ (0.2 ml. 15% TiCl₃ equiv. to 2.5 g. of SnCl₂·2H₂O); As does not interfere. TiCl₃ may similarly be used in place of SnCl₂ in the colorimetric determination of Mo in absence of W. R. T.

Precipitation and determination of antimony using a mixture of hypophosphorous and sulphuric acids. L. FAUCHON and L. VIGNOLI (J. Pharm. Chim., 1937, [viii], 25, 541—545).—Sb is quantitatively pptd. as such by a mixture of H₃PO₂ and H₂SO₄. The ppt. is sol. in a mixture of KI and tartaric acid, and a quant. method is described. Under the same conditions, pptn. of As is incomplete. Sb can also be determined diaphanometrically using this method, the limit being 0.02 mg. as in the case of As. J. N. A.

Determination of antimony by formation of iodine-antimony-potassium complex. L. FAUCHON (J. Pharm. Chim., 1937, [viii], 25, 537—541).—Colorimetric and volumetric methods are described. They depend on the fact that KI and H₂SO₄ produce a golden-yellow colour with Sb salts, due to formation of an Sb-I-K complex. The end-point is sharp. J. N. A.

[Determination of antimony in lead.]—See B., 1937, 795.

Determination of bismuth as phosphate. W. R. SCHOELLER and D. A. LAMBIE (Analyst, 1937, 62, 533—537).—In presence of SO₄⁼⁼, Bi₂(SO₄)₃ is co-pptd. with BiPO₄. Schoeller and Waterhouse's method (A., 1921, ii, 135) is modified so as to prevent Bi₂(SO₄)₃ from appearing in the final ppt. after dissolution of the Bi₂S₃ ppt. in HNO₃. Bi is pptd. as Bi₂(CO₃)₃ leaving SO₄⁼⁼ in solution. The Bi₂(CO₃)₃ is taken up in HNO₃ and the original method followed. E. C. S.

Burner with adjustable flame spreader. P. BLACKMAN (Chem. and Ind., 1937, 656). J. S. A.

Construction of electrically heated laboratory [muffle] furnaces. M. MIELDS (Chem.-Ztg., 1937, 50, 516—517).—Details for furnaces working up to 1350° are discussed. J. S. A.

Cylindrical nickel-chromium electro-furnace giving a temperature of 1100°. V. I. SERDJUKOV (Zavod. Lab., 1937, 6, 247—248). R. T.

Laboratory furnace for fusion and pouring out of metals in a vacuum. S. V. SERGEEV and D. S. SCHREIBER (Zavod. Lab., 1937, 6, 242—246). R. T.

(A) Small laboratory cryptol furnace. (B) Adaptation of cylindrical cryptol furnaces for combustions. V. A. LEBEDEV (Zavod. Lab., 1937, 6, 376—377, 379—380).—Apparatus is described. R. T.

Mixing device for thermochemical calorimeters. W. P. WHITE and H. S. ROBERTS (J. Amer. Chem. Soc., 1937, 59, 1254—1256).—The device permits powders to be liberated very rapidly into a solution, after being immersed so as to reach the calorimeter temp. E. S. H.

(A) Thermoregulators and thermostats for measurements of prolonged heat effects. (B) Apparatus for automatic registration of prolonged heat effects. W. SWIENTOSLAWSKI and J. POMORSKI. (C) Calorimetric study of slow reactions. W. SWIENTOSLAWSKI (Rocz. Chem., 1937, 17, 254—261, 262—268, 269—283).—Apparatus and methods are described. R. T.

Improved mercury-toluene thermoregulator. I. G. NAGATKIN (Zavod. Lab., 1937, 6, 255). R. T.

Gas thermoregulator. R. M. KINGSBURY (Ind. Eng. Chem. [Anal.], 1937, 9, 333).—The device is suitable for controlling the temp. of a 12-litre bath within ±0.5° over the range 50—100°. E. S. H.

Sulphur b.p. apparatus with internal electric heating. C. R. BARBER (J. Sci. Instr., 1937, 14, 227—229).—The apparatus described, suitable for calibrating thermocouples, is made of Pyrex glass with a Pt heater immersed in the S and connected to Pt leads sealed directly through the Pyrex below the S. This method of heating reduces risk of fracture on remelting. The b.p. is accurate to 0.1°. N. M. B.

Modification of the Berl-Kullmann m.p. block. Electrically heated, glass m.p. apparatus. F. W. BERGSTROM (Ind. Eng. Chem. [Anal.], 1937, 9, 340—341).—Apparatus and technique are described. E. S. H.

Colour pyrometer for measurement of high temperatures. N. I. SINJAKOV (Zavod. Lab., 1937, 6, 327—332).—The construction and use of colour pyrometers of the type developed by Nesper (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1929, 373) are described. R. T.

Properties of radiation detectors, with special reference to thermo-elements. H. THEISSING (Physikal. Z., 1937, 38, 557—564).—The sensitivity of thermo-elements, thermopiles, and bolometers for the determination of radiation is considered. A. J. M.

Coated porcelain tubes as stable protective sheaths for thermo-couples. S. P. ZAMOTAEV and S. M. BESEDIN (Zavod. Lab., 1937, 6, 377—379).—Porcelain tubes are coated with a paste consisting of carborundum 90, fireclay 5, and dextrin 5 parts, in H_2O , and this coating is covered with a second one of fireclay made up into a paste with aq. Na silicate. The tube is dried at 120° , and then fired for 1 hr. at 1200° . R. T.

Thermal conductivity of rocks. F. BIRCH and H. CLARK (Physical Rev., 1936, [ii], 49, 479).—An apparatus for routine measurements of the thermal conductivity of rocks etc., up to 500° , has been constructed. L. S. T.

Thermal conductivity method for the determination of isotopic exchanges in the simpler gaseous molecules. N. R. TRENNER (J. Chem. Physics, 1937, 5, 382—392).—Constructional and operational details of a thermal conductivity gauge of good mechanical stability, freedom from poisoning effects, and high accuracy are given. The applicability of the apparatus is considered and its use in studying the various isotopic species of the lower paraffins and hydrogen is discussed. The theory of the gauge is developed. W. R. A.

Analysis of ternary gas mixtures by thermal conductivity measurements. J. L. BOLLAND and H. W. MELVILLE (Nature, 1937, 140, 63).—A method which may be applied to any ternary mixture, one component of which is H_2 , and the other two are gases of different thermal conductivity, is described. The vol. of gas required may be reduced to 0.01 c.c. at n.t.p. by the use of a micro-cell. L. S. T.

Interrupted arc for spectral analysis. N. S. SVENITZKI (Zavod. Lab., 1937, 6, 325—326).—Apparatus is described. R. T.

Measurement of pressures in the upper atmosphere. J. KAPLAN (Nature, 1937, 139, 1112).—A spectroscopic method is suggested. L. S. T.

Optical measurement of the thickness of a film adsorbed from a solution. I. LANGMUIR and V. J. SCHAEFER (J. Amer. Chem. Soc., 1937, 59, 1406).—Technique is described and preliminary results are reported. E. S. H.

Determination of crystal lattice parameters on the basis of unilateral roentgenograms (micro-section method). E. I. SOVS (Zavod. Lab., 1937, 6, 332—334).—Mathematical. R. T.

Polarisation filters employing dichroic crystals. M. HAASE (Z. tech. Physik, 1937, 18,

69—72).—A lecture. The transmission and degree of polarisation of the Zeiss filters have been measured from 7500 to 4500 Å., and the effect of oblique incidence has been determined. O. D. S.

Polaroid films. H. FREUNDLICH (Chem. and Ind., 1937, 698—699).—The polaroid film is a new device for producing polarised light, excelling in its large aperture. It is based on the strong dichroism of herapathite and similar salts and consists of a suspension of very small, anisotropic particles of such a substance, oriented by streaming, in a layer of a cellulose ester.

High-speed high-precision microphotometer. H. B. VINCENT and R. A. SAWYER (J. Opt. Soc. Amer., 1937, 27, 193—197).—A new type of instrument using high-aperture lenses is described. N. M. B.

Fluorometer based on the effect of Debye and Sears. L. A. TUMERMANN and V. SCHIMANOVSKI (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 323—326).—The apparatus depends on the use of diffraction of light by ultrasonic waves. It gives higher intensities of modulated light than the method using the Kerr effect, and it can be used in the ultra-violet. A. J. M.

X-Ray microscope. L. VON HÁMOS (Nature, 1937, 140, 30; cf. A., 1934, 980).—An X-ray microscope, by means of which a true enlarged image of chemically different layers is obtained, depends on the focussing of the characteristic secondary radiation emitted from a surface layer of an object subjected to primary X-ray irradiation. Chemical analysis for many elements in objects $>10^{-8}$ c.c. without dissipating the sample becomes possible. L. S. T.

X-Ray intensifying screens adapted to structure analysis. N. H. KOLKMEIJER, C. J. KROM, and H. KUNST (Nature, 1937, 140, 67—68).—The use of the Ilford Fluorazure screen shortens the time of exposure needed to obtain X-ray photographs of tissue fibres for analysis of their structure. L. S. T.

Sources of light for photochemical processes. K. VOGL (Chem. Fabr., 1937, 10, 296—299).—The different types of electric lighting available—incandescence, Hg and Na vapour, and arc lamps—are compared. I. C. R.

Use of Jena dispersion filter as a monochromator for photochemical purposes. G. HOLST (Z. wiss. Phot., 1937, 36, 145—155).—The filter consists essentially of an optically isotropic borosilicate glass in coarse powder with a filter liquid (BzOH ester), the two phases having the same refraction within only a certain small range of λ , depending on the temp. By use with a prismatic spectrometer and a suitable source of light, nearly monochromatic light can be obtained, between 700 and 400 m μ , according to temp. The relation between the mean λ and temp. has been determined. J. L.

Action of ultra-violet light on aliphatic hydrocarbons. II. Universal apparatus for the study of photochemical reactions of gases. W. KEMULA

(Rocz. Chem., 1937, 17, 175—180).—Apparatus is described. R. T.

Preparation of galvanometer indicators. G. V. FRIDRICH (Zavod. Lab., 1937, 6, 380).—A cylinder of Al foil (0.02 mm.) is prepared by wrapping around 0.3 mm. wire. R. T.

Automatic null-point adjustment device for titration. L. P. ADAMOVITSCH and N. R. VOLKOV (Zavod. Lab., 1937, 6, 253). R. T.

The Beha moisture-meter. F. MENDLIK (Chem. Weekblad, 1937, 34, 465—466).—The instrument measures the capacity of a condenser filled with the substance the H_2O content of which is to be determined, viz., a moist powder or granular material such as yeast, corn, or meal. From this the dielectric const. and hence, for any given substance, the H_2O content can be deduced. The instrument can be graduated to indicate the dielectric const. directly, and, if used always with one type of material, the H_2O content. Data showing good agreement with direct determinations are reported for yeast. D. R. D.

Sealed-in glass micro-electrode. G. E. PICKFORD (Proc. Soc. Exp. Biol. Med., 1937, 36, 154—157).—An electrode with capacity 0.06—0.25 c.c. is described. W. O. K.

Salt bridge for electrometric measurements. W. M. BRIGHT and E. L. MILLER (Ind. Eng. Chem. [Anal.], 1937, 9, 346).—Modified apparatus is described. E. S. H.

Brightness of cathodo-luminescence at low current densities and low voltages. T. B. BROWN (J. Opt. Soc. Amer., 1937, 27, 186—192).—With artificial willemite as the luminescent substance, for low c.d. J , and accelerating potentials V 200—800 volts, the brightness of luminescence B is given by $B = KJV^2$. A method of overcoming the difficulty of determining the potential of the target surface for work at low voltages is described. N. M. B.

Controlled cathode sputtering. G. TIMOSHENKO (Nature, 1937, 140, 67).—The apparatus described allows accurate measurements of the rates of sputtering and of secondary electron emission from solid metals bombarded by A ions to be made. L. S. T.

Use of krypton-filled ionisation chambers for cosmic-ray measurements. S. ZIEMECKI (Nature, 1937, 140, 150—151).—Ionisation due to cosmic rays is $>$ twice as great in Kr as in A. L. S. T.

Recording field current electrons with a Geiger-Müller counter. R. T. K. MURRAY (Physical Rev., 1936, [ii], 49, 195). L. S. T.

Geiger-Müller photon counter. Quantitative aspects, detection of small intensities, use in absorption spectroscopy. W. D. CLAU and A. HOLLAENDER (Physical Rev., 1936, [ii], 49, 409). L. S. T.

Determination of frequency distribution characteristics with a photo-electric integrator. I. J. SAXI (Physical Rev., 1936, [ii], 49, 479).—The photo-electric device developed automatically measures the relative times of exposure of a photo-cell placed in the path of a moving beam of light. Frequency distribution curves thus obtainable have been applied to the analysis of textile yarns and metal wires. L. S. T.

Gas density balance for determination of the absolute density of protium-deuterium mixtures and other gases. N. R. TRENNER (J. Amer. Chem. Soc., 1937, 59, 1391—1395).—Modified apparatus and technique are described. E. S. H.

Hydrostatic micro-balance and its application to study of kinetics of heterogeneous reactions. N. A. FIGUROVSKI (Zavod. Lab., 1937, 6, 335—340).—The construction and use of a hydrostatic balance are described. R. T.

Sedimentation analysis with a specific gravity balance. E. HOFFMANN (Kolloid-Z., 1937, 79, 314—315).—The principles underlying the use of a sp. gr. balance for the size-analysis of heterogeneous suspensions of a single substance are explained. Better results are obtained if the cylindrical buoyancy piece is only partly immersed. F. L. U.

Operation of analytical micro-balances highly sensitive to temperature changes. F. BREUER (Ind. Eng. Chem. [Anal.], 1937, 9, 354).—Precautions are discussed. E. S. H.

Laboratory gas generator. G. P. ISCHTSCHENKO (Zavod. Lab., 1937, 6, 254).—Apparatus for generating gas from petrol is described. R. T.

Macro- or micro-Gooch filter. R. E. DUNBAR (Ind. Eng. Chem. [Anal.], 1937, 9, 355). E. S. H.

Simple apparatus for automatic filtration. A. P. WEBER (Chem. Weekblad, 1937, 34, 515—516).—A simple apparatus constructed from a conical flask or bottle, glass tubing, and a Buchner filter is described. S. C.

Preparation of membranes having graded porosities. Properties of "gradacol" membranes as ultrafilters. W. J. ELFORD (Trans. Faraday Soc., 1937, 33, 1094—1104; cf. A., 1933, 546).—The production of membranes with graded porosities by incorporating various liquids in the parent collodion and evaporating under known conditions is described. The behaviour of these membranes as ultrafilters, and the derivation, significance, and dependability of the "factor" employed in deducing the particle diameter of a suspension from the limiting pore diameter capable of retaining all the disperse phase, are discussed. J. W. S.

Improvements in apparatus for centigram elementary analysis. B. BROBANSKI (Z. anal. Chem., 1937, 109, 338—341).—A needle valve is used for regulating the O_2 supply in C-H combustions. Improvements in O_2 -purification tubes, in the gas regulator, and in the making of connexions to the combustion tube are described. J. S. A.

Micro-centrifuge. W. MACNEVIN (Ind. Eng. Chem. [Anal.], 1937, 9, 356).—The apparatus is suitable for centrifuging hot solutions (e.g., in the separation of $PbCl_2$ and $AgCl$). E. S. H.

Ultra-centrifuge and the study of high-molecular compounds. T. SVEDBERG (Nature, 1937, 139, 1051—1062).—Apparatus and experimental pro-

cedure are described and illustrated. Recent work on proteins is summarised and mol. consts. are tabulated. L. S. T.

Sedimentation equilibrium in the simplest air-driven tops. J. W. McBAIN and C. ALVAREZ-TOSTADO (*Nature*, 1937, **139**, 1066).—A simple rotor for ultracentrifuging solutions of pure substances such as sucrose in order to determine mol. wt. is described. L. S. T.

Micropreparative methods in organic chemistry. A. DADIEU and H. KOPFER (*Angew. Chem.*, 1937, **50**, 367—372).—A general description of technique is given and apparatus is figured. F. L. U.

Intermittent tube-inverter. J. F. BARRETT (*J. Sci. Instr.*, 1937, **14**, 247—248).—The apparatus, for inverting tubes used in the extraction of pigments and fats from aq. solutions by org. solvents, operates and is regulated by the flow of water alternately into two cups which can rotate in a circle in a vertical plane about a horizontal axis supporting a bar at the ends of which the cups are mounted. N. M. B.

Apparatus for analysis of nitrate-nitrite mixtures. E. I. GAVASCH and V. P. VANIASCHINA (*J. Chem. Ind. Russ.*, 1937, **14**, 423—424).—A gasometric method, involving decomp. of NO_2 by AlCl_3 , and of NO_3 by Fe^{II} , is described. R. T.

Reaction micro-apparatus. D. S. BINNINGTON (*Ind. Eng. Chem. [Anal.]*, 1937, **9**, 353).—Modified apparatus is described. E. S. H.

Sloping manometer. M. BURTON (*Ind. Eng. Chem. [Anal.]*, 1937, **9**, 335).—The apparatus is suitable for the continuous reading of pressures of about 1 mm. undergoing const. variation. E. S. H.

Recording by means of emanating power of changes in structure and surface even of very short duration. Thermal decomposition of thorium oxalate. H. J. BORN (*Z. physikal. Chem.*, 1937, **179**, 256—262).—A modified apparatus for Hahn's emanation method of investigating the above changes is described; the ionisation current produced by the emanation flows to earth through a high resistance, the p.d. between the ends of which is recorded continuously by an electrometer. Application of the new procedure to the decomp. of $\text{Th}(\text{C}_2\text{O}_4)_2 \cdot 6\text{H}_2\text{O}$ indicates that the state of combination of two of the H_2O mols. differs from that of the other four. R. C.

Building nuclear crystal structure models. D. J. FISHER and E. H. STEVENS (*Amer. Min.*, 1937, **22**, 268—278).—A simplified method is described and illustrated by directions for the construction of a model of sanidine. L. S. T.

Purification and determination of the degree of purity of liquids. W. SWIENTOSLAWSKI (*Trav. Congr. Jubil. Mendeleev*, 1937, **2**, 283—297).—Ebulliometric methods are described (cf. *A.*, 1936, 1482). C. R. H.

Principle of the Cartesian diver applied to gasometric technique. K. LINDERSTØM-LANG (*Nature*, 1937, **140**, 108).—A method for measuring small amounts of gas liberated during chemical reactions is described. L. S. T.

Pressure regulator for vacuum distillation. R. L. EMERSON and R. B. WOODWARD (*Ind. Eng. Chem. [Anal.]*, 1937, **9**, 347—348). E. S. H.

Laboratory purification of gases by fractional distillation. H. S. BOOTH and A. R. BOZARTH (*Ind. Eng. Chem.*, 1937, **29**, 470—475).—A method and automatic apparatus for purifying gases, *e.g.*, chlorofluorides, by low-temp. fractional distillation, together with methods of testing the reflux ratio, and the m.p. and v.p. of the product, are given. D. K. M.

Influence of expansion of vapours on the efficiency of distillation. W. SWIENTOSLAWSKI and E. RAMOTOWSKI (*Rocz. Chem.*, 1937, **17**, 201—208).—The liquid is distilled in an apparatus consisting of four condensers, into which the vapour enters successively through valves, at the same time undergoing adiabatic expansion, so that a temp. gradient is formed. The apparatus gives more efficient rectification than do other types. R. T.

Design and analysis of fractionating columns for complex mixtures.—See B., 1937, 737.

Jean Beguin and his "Tyrocinium Chymicum." T. S. PATTERSON (*Ann. Sci.*, 1937, **2**, 243—298).—Historical.

Geochemistry.

Thermal springs in Central America. E. C. DEGER (*Chem. Erde*, 1937, **11**, 249—255).—The H_2O of medicinal hot springs in the volcanic district around Quezaltenango, Guatemala, contains free H_2SO_4 , $\text{Al}_2(\text{SO}_4)_3$, Na_2SO_4 , colloidal H_2SiO_3 , etc. L. J. S.

Influence of bog-water on the water of the Upper Vltava River. J. KORAN (*Chem. Listy*, 1937, **31**, 253—257).—The peat bogs at the sources of the Vltava do not contribute significantly to the contamination of the river H_2O . R. T.

Salt efflorescences and ground waters of the Hungarian Great Plain. S. A. ARANY and J. BABARCY (*Mezog. Kutat.*, 1937, **10**, 89—96).—

Deterioration due to alkali and Mg is uniform throughout the region, the efflorescences consisting mainly of Na salts, Na_2SiO_3 being uniformly present in considerable amounts. The ground waters are all alkaline, the anions corresponding with those present in the efflorescences in the various districts. E. C. S.

Composition of well-water of the Hungarian Great Plain. S. A. ARANY (*Mezog. Kutat.*, 1937, **10**, 107—118).—The H_2O from both drilled (deep) and dug (shallow) wells was alkaline in the northern region. E. C. S.

Sediments dredged by the "President Theodore Tissier." (Continental shelf of the English

Channel and the North Sea.) L. BERTHOIS and J. FURNESTIN (Compt. rend., 1937, 204, 1876—1878).—The sand deposits of various parts of the Continental shelf have been examined and classified according to size of grains. The results indicate that the mineral deposits off the coast of Holland may have their origin in the rocks of the English and French coasts. Currents play an important role in the building up of sand deposits and may considerably modify the mineral composition. W. R. A.

Geochemistry and the periodic system of the chemical elements. V. M. GOLDSCHMIDT (Trav. Congr. Jubil. Mendelceev, 1937, 2, 387—396).—The geochemical properties of Ga, Sc, and Ge are discussed in relation to their positions in the periodic table, and the probable properties of elements having at. no. >92 are deduced. C. R. H.

Outgrowths on zircon in the Middle Jurassic of Yorkshire. F. SMITHSON (Geol. Mag., 1937, 74, 281—283; cf. this vol., 102). L. S. T.

Rocks of the Kedong Scarp, Kenya Rift Valley. S. J. SHAND (Geol. Mag., 1937, 74, 262—271).—Chemical analyses of a trachyrhyolite and an olivine-basalt are recorded. L. S. T.

Geology and ore deposits of the Bayard area, Central Mining District, New Mexico. S. G. LASKY (U.S. Geol. Survey, 1936, Bull. 870, 144 pp.).—The general character and distribution of the rocks, rock alteration, and ore deposits, their mineralogy and paragenesis, are described. L. S. T.

Geology of the Coastal Plain of S. Carolina. C. W. COOKE (U.S. Geol. Survey, 1936, Bull. 867, 196 pp.).—Mainly stratigraphical. Mineral resources are briefly discussed. Chemical analyses of the ground H_2O of the various counties are recorded. L. S. T.

Geology of the Monument Valley-Navajo Mountain region, San Juan County, Utah. A. A. BAKER (U.S. Geol. Survey, 1936, Bull. 865, 106 pp.).—Mineral resources are discussed. Chemical and physical properties of oil from the San Juan oilfield are recorded. L. S. T.

Geology of the Tonsina district, Alaska. F. H. MORFITT (U.S. Geol. Survey, 1936, Bull. 866, 38 pp.). L. S. T.

Braunite from Mason Co., Texas. D. F. HEWITT and W. T. SCHALLER (Amer. Min., 1937, 22, 785—789).—Braunite (I) (chemical analysis and goniometric measurements given) forms the principal Mn mineral of the Spiller mine. The common oxides of Mn are absent. Isomorphous relationships between Mn_2O_3 and Fe_2O_3 in (I) are discussed. L. S. T.

Chalcomenite from Bolivia. C. PALACHE (Amer. Min., 1937, 22, 790—795).—Chalcomenite from a new locality, Hiaco mine, Pacaake, is orthorhombic with $a:b:c = 0.7325:1:0.8077$, a_0 6.65, b_0 9.10, c_0 7.36 Å., $a_0:b_0:c_0 = 0.731:1:0.809$; space-group $P2_12_12_1$, and $Cu_4SO_4O_{12} \cdot 8H_2O$ per unit cell; d 3.35, hardness 2+; n_x 1.712, n_y 1.732, n_z 1.732, all ± 0.002 . Crystals are clear blue, transparent, and pleochroic. L. S. T.

Helvite from the Butte district, Montana. D. F. HEWITT (Amer. Min., 1937, 22, 803—804).—The occurrence of helvite, $3MnBeSiO_4 \cdot MnS$, as sparse yellow grains in a specimen consisting mainly of rhodonite and rhodochrosite is described. L. S. T.

Cristobalite at Crater Lake, Oregon. C. E. DUTTON (Amer. Min., 1937, 22, 804—806). L. S. T.

Relation between chemical composition and physical properties in the garnet group. M. FLEISCHER (Amer. Min., 1937, 22, 751—759).—The direct relationship between chemical composition and physical properties observed by Ford (A., 1915, ii, 570) has been confirmed by an examination of the analyses of garnets published since 1915. Calc. and observed vals. of n , and chemical compositions in % of pyrope, grossularite, spessartite, almandite, uvarovite, and andradite, of 57 garnets from numerous localities are recorded. Calc. and observed (X-ray) vals. of a_0 for 19 garnets are given. L. S. T.

Crystal structures of alunite and the jarosites. S. B. HENDRICKS (Amer. Min., 1937, 22, 773—784).—X-Ray diffraction data give the following vals. of a and c for alunite (I), jarosite (II), argento-, natro-, ammonio-, and plumbo-jarosite, and the synthetic compound $3Fe_2O_3 \cdot 4SO_3 \cdot 9H_2O$: 6.96, 17.35; 7.20, 17.00; 7.22, 16.40; 7.18, 16.30; 7.20, 17.00; 7.20, 33.60; 7.16 and 16.90. Vals. for $d_{calc.}$ are 2.80, 3.24, 3.80, 3.29, 3.09, and 3.71, respectively. Crystals of (I) and (II) are pyroelectric, and for (I) this requires the space-group to be $C_{2v}^2 - R3m$, and the univalent jarosites probably have the same structure. The crystal structure of the (I)-(II) group of minerals, including karphosiderite, borgstromite, and hamlinite, is illustrated and discussed, and an explanation of the various types of isomorphous replacements shown by the group is advanced. These structures are characterised by linking between OH groups and an O of an SO_4 . L. S. T.

Mixed crystals $Mg_2Si_2O_6$ - $LiAlSi_2O_6$ and Mg_2SiO_4 - $LiAlSiO_4$. E. DITTLER and A. HOFMANN (Chem. Erde, 1937, 11, 256—277).—In the system $Mg_2Si_2O_6$ - $LiAlSi_2O_6$ (Roozeboom's type V) $MgSiO_3$, as clinoenstatite (m.p. 1557°), can take up 20 mol.-% of $LiAlSi_2O_6$ in solid solution, and $LiAlSi_2O_6$, as optically uniaxial α -spodumene (m.p. 1380°), can take up 10 mol.-% $MgSiO_3$; in the gap there is an eutectic at 1250°. In the system Mg_2SiO_4 - $LiAlSiO_4$ (Roozeboom's type IV), Mg_2SiO_4 , as forsterite (m.p. 1890°), takes up 30 mol.-% of $LiAlSiO_4$, and $LiAlSiO_4$, as hexagonal α -eucryptite (m.p. 1388°), takes up 10 mol.-% Mg_2SiO_4 ; in the gap there is a break down to Li-spinel and mixed crystals of clinoenstatite with α -spodumene, and a eutectic at 1270°. Here there is a replacement of Mg_2 by $LiAl$ in the crystal structure. L. J. S.

Formation of dolomite and dolomitisation. G. LINCK (Chem. Erde, 1937, 11, 278—286).—A criticism (cf. Reuling, Abh. Senckenb. Naturf. Ges., 1934, 428, 1—44). L. J. S.

Montmorillonite from Dolmar, Meiningen. H. JUNG (Chem. Erde, 1937, 11, 287—293; cf. this vol., 206).—Analysis of the more abundant

pale yellow material associated with the pink shows this to be also montmorillonite. L. J. S.

Occurrence of montmorillonite in some decomposition products of basalt in the Vogelsberg. W. NOLL (Chem. Erde, 1937, 11, 294—306).—Clayey material ("bole") found in fissures and pockets in weathered basalt at several localities was found in most cases to show the X-ray pattern of montmorillonite (I). n is also near to that of (I) from Montmorillon (1.541 on material dried at 110°). A white bole from Langsdorf gave SiO_2 50.72, Al_2O_3 15.97, Fe_2O_3 2.14, MgO 5.73, CaO 1.99, $\text{H}_2\text{O} + 7.84$, $\text{H}_2\text{O} - 15.92 = 100.31$, and a dehydration curve similar to that of montmorillonite; the excess of SiO_2 (over $\text{Al}_2\text{O}_3 : \text{SiO}_2 = 1 : 2$) is no doubt due to admixed quartz. The spacing ranges from 19.18 Å. for moist material, 14.46 Å. air-dried, to 11.77 Å. dried at 110°. The formation of (I) is favoured with a Mg-rich rock and alkaline solutions; under other conditions kaolin is formed (A., 1936, 449).

L. J. S.
Alteration of biotite. M. MEHREL (Chem. Erde, 1937, 11, 307—332).—50% aq. H_2SO_4 passed over small flakes of biotite for many hr. extracted all the bases and some SiO_2 , leaving white flakes of amorphous SiO_2 (n 1.420). More dil. acid acts in the same direction but much more slowly. Alkali produces a red Fe coating on the flakes. When heated at 450—700° the biotite changes to yellow, n from 1.650 to 1.823, and $2E$ from 0° to 82°. It is suggested that bleached biotite (bauerite) in sedimentary rocks has been confused with muscovite and clay minerals.

L. J. S.
New types of pleochroic haloes. G. H. HENDERSON (Nature, 1937, 140, 191; cf. this vol., 275).—Examination of numerous biotite specimens from all parts of the world shows the existence of six types of pleochroic haloes. Four of these types, three of which are new, appear to arise from parents of such short periods that all activity has ceased. Ring radii and associated α -particles are given. All six types can be accounted for by known radioactive elements, and the radii appear to be const. in haloes contained in minerals of all geological ages.

L. S. T.
Roweite, a new mineral from Franklin, New Jersey. H. BERMAN and F. A. GONYER (Amer. Min., 1937, 22, 301—303).—Roweite, d 2.92 ± 0.02 , hardness approx. 5, has (X-ray) a_0 8.27 ± 0.01 , b_0 9.01 ± 0.01 , c_0 6.62 ± 0.02 Å.; MnO 28.30, MgO 1.66, ZnO 3.13, CaO 25.40, B_2O_3 32.40, H_2O 8.51, insol. 0.84, total 100.24%, corresponding with $4[\text{H}_2(\text{Mn}, \text{Mg}, \text{Zn})\text{Ca}(\text{BO}_3)_2]$, with $\text{Mn} : \text{Mg} : \text{Zn} = 10 : 1 : 1$, mol. wt. of unit cell 873.

L. S. T.
Fluorescent sodalite. L. L. SMITH (Amer. Min., 1937, 22, 304—306).—The sodalite which occurs in the nepheline syenite from Beemerville, New Jersey, fluoresces a brilliant red-orange colour in ultra-violet light, by means of which it can be distinguished from the nepheline. A similar behaviour is shown by the sodalite which occurs in the nepheline syenite from Red Hill, New Hampshire.

L. S. T.
Paragenesis of the minerals from Blueberry Mountain, Woburn, Massachusetts. W. E.

RICHMOND, jun. (Amer. Min., 1937, 22, 290—300).—These minerals are explained in terms of a magmatic sequence, granodiorite, granite, aplite, and pegmatite, followed by two periods of hydrothermal activity during which many minerals, including allanite, orangite, and babingtonite, were deposited in the pegmatites and intersecting veins and in the surrounding rocks.

L. S. T.
Minerals and associated rocks at Copper Mine Hill, Rhode Island. A. QUINN and J. A. YOUNG, jun. (Amer. Min., 1937, 22, 279—289).

L. S. T.
Thenardite crystals from Rhodes Marsh, Nevada. P. S. HEINS (Amer. Min., 1937, 22, 307—308).

L. S. T.
Occurrence of stilbite in the Border Conglomerate, near Culpepper, Virginia. R. O. BLOOMER (Amer. Min., 1937, 22, 309—310).

L. S. T.
Granite pegmatites of Southern Norway. H. BJØRLYKKE (Amer. Min., 1937, 22, 241—255).—Minerals found in Norwegian granite pegmatites are tabulated, and X-ray analyses of Norwegian columbites and tantalites are given. The origin of the pegmatites carrying rare minerals is discussed. The amounts of the characteristic elements, Ti, Nb, Ta, W, and Be, vary widely in the different pegmatites, and no relationship between the main composition of the pegmatite and the amount of rare minerals is apparent. The accessory elements of the granite pegmatites are divided into the four groups, (i) the rare-earth elements (Y, La, and lanthanides), Th, and U, (ii) Zr and Hf, (iii) Ti, Nb, Ta, and W, and (iv) Be. The absence of minerals containing Li and Sn is characteristic of these pegmatites. The sequence of crystallisation in the two genetic groups viz., (a) magmatic, and (b) hydrothermal pneumatolytic pegmatites, into which the granite pegmatites may be divided, is discussed in detail.

L. S. T.
(A) **Geology of part of the Upper Luangwa Valley, N.-E. Rhodesia.** (B) **Pre-Karoo landscape of the Lake Nyasa region, and a comparison of the Karoo structural directions with those of the Rift Valley.** F. DIXEY (Quart. J. Geol. Soc., 1937, 93, 52—76, 77—93).

L. S. T.
Carboniferous limestone of the Mitcheldean area, Gloucestershire. T. F. SIBLY and S. H. REYNOLDS (Quart. J. Geol. Soc., 1937, 93, 23—51).—The geological succession is described and illustrated.

L. S. T.
Kalgoorlie geology re-interpreted. J. K. GUSTAFSON and F. S. MILLER (Econ. Geol., 1937, 32, 285—317).

L. S. T.
Geology of the Little Long Lac [Gold] Mine [near Lake Superior]. E. L. BRUCE and W. SAMUEL (Econ. Geol., 1937, 32, 318—334).—The ore deposits are lodes made up of narrow veins of quartz (I). Metallic minerals, mainly sulphides, are present, but are not abundant in the veins. Arsenopyrite and pyrite form approx. 1.5% of the ore. Au occurs somewhat abundantly and uniformly distributed throughout (I), so that 20% of (I) is sufficient to form ore. The wall rocks are scarcely altered and contain little Au.

Origin of the bedding replacement deposits of fluorspar in the Illinois field. L. W. CURRIER (Econ. Geol., 1937, **32**, 364—386).—The banded fluorspar deposits of the Cave In Rock district are attributed to replacement of limestone and the preservation of bedding and cross-bedding of the rock. Reaction between HF and CaCO_3 was stoichiometric, but the consequent reduction in vol. was made good by continued deposition of CaF_2 from other places. Bastin's view (Illinois State Geol. Survey, 1931, Bull. 58) that banding is due to periodic pptn. is not supported. L. S. T.

Mineralisation and metamorphism at the Eustis mine, Quebec. J. S. STEVENSON (Econ. Geol., 1937, **32**, 335—363).—The pyrite-chalcopyrite deposit of this mine is described, and the association with sodic rocks and the localisation of pyrrhotite and cubanite in the ore is pointed out. The country rocks comprise schistose sodic porphyry, muscovite schist resulting from its metamorphism, and a massive carbonate rock that is largely a hydrothermal alteration product of the schist. Chemical analyses [A. WILLMAN] of these related rocks are given and discussed. The ore bodies were formed probably from hydrothermal solutions, source unknown, and not from aquo-igneous melts. L. S. T.

X-Ray analysis of the structure of fibrous tourmaline. S. R. SWAMY and K. Y. S. IYENGAR (Proc. Indian Acad. Sci., 1937, **5**, A, 419—422).—Specimens of tourmaline, marginally fibrous, have been examined. The fibrous portion in which the crystallites are arranged with [c] as fibre axis have the same cell dimensions as the core, which is a single crystal, or a mosaic of similarly oriented crystallites. F. J. L.

Genesis of the Permian salt deposits. V. I. NIKOLAEV, N. I. BUJALOV, and I. N. LEPESCHKOV (Bull. Acad. Sci. U.R.S.S., 1937, 399—412).—The salt deposits of Solikamsk and of Western Kazakstan originate from the drying up of the Permian Sea, which shrank in a S.W. direction. The Solikamsk deposits originate from a time when the brine had a concn. < the eutectic, and thus too low for crystallisation of K and Mg sulphates, which took place later, in W. Kazakstan, when the more conc. brine had flowed to the last remnants of the Permian Sea, now represented by Lake Inder. R. T.

Kainite and polyhalite in the salt deposits of the Soviet Union. N. S. KURNAKOV, G. B. BORKIJ, and I. N. LEPESCHKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 331—336).—The physical properties of kainite, found in the Osinki region, and of polyhalite, found in the Aschtscha-Bulak region, are described. A. J. M.

Potash deposits on the right bank of the Volga and in Calmuck. V. I. NIKOLAEV, O. K. JANATJEVA, and V. D. POLJAKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, **15**, 337—340).—The composition of the deposits is given. A. J. M.

Crystalline form of acmite. G. CESARO and J. MELON (Bull. Acad. roy. Belg., 1937, [v], **23**, 439—455).—An examination and discussion of available data. N. M. B.

Chemical composition of three varieties of Hsin Shih or arsenic stones. H. Y. FANG, C. L. LIU, and P. P. T. SAH (Sci. Rep. Nat. Tsing Hua Univ., 1937, **4**, A, 49—51).—Red, white, and black varieties of this stone contained H_2O 0.01, 0.21, and 0.07, As 76.34, 74.4, and 74.66, S 0.01, 0.11, and 0.05, and unsublimable residue 0.07, 3.6, and 1.28 (SiO_2 0, 2.6, and 0.86%), respectively. R. S. C.

"Bidalotite," a new orthorhombic pyroxene derived from cordierite. B. R. RAO and L. R. RAO (Proc. Indian Acad. Sci., 1937, **5**, B, 290—296).—This occurs in a biotite-cordierite-hypersthene-granulite near Bidaloti in Mysore. It differs from the associated hypersthene in containing Al_2O_3 4.90—10.55%, in its striking pleochroism, α pale yellow to colourless, β and γ lilac or purple, and α 1.656, β 1.667, γ 1.672. L. J. S.

Mineralogical nature of the clays of El Golea (Sahara). J. DE LAPPARENT (Compt. rend., 1937, **204**, 1776—1778).—The clays are of the attapulgitic type, but contain more K; they are analogous to bravaisite. A. J. E. W.

Attapulgitic clay. P. F. KERR (Amer. Min., 1937, **22**, 534—550).—X-Ray diffraction studies, determinations of n , and chemical analyses point to the identity of the clay mineral constituent in the fuller's earth from Attapulgitic with montmorillonite (I). Recent data concerning a new mineral species "attapulgitic" are not verified. The clay probably represents an accumulation of (I) as a weathering product from the decomp. of certain cryst. rocks of the highlands. Field relations of the clay, its structure and texture, as well as settling experiments, indicate that the fuller's earth beds were accumulated under shallow H_2O .

Identification of certain gem-stone materials by their emission spectra. D. H. HOWELL (Amer. Min., 1937, **22**, 796—802).—The technique described requires approx. 0.1 mg. of material, and a test with specimens of garnet, spinel, jadeite, nephrite, epidote, sillimanite, tourmaline, and andalusite gave a satisfactory differentiation of the various species. The method is applicable generally in distinguishing between species which have similar optical and physical properties, but different chemical composition. L. S. T.

Investigation of precious stones. J. BOLMAN (Chem. Weekblad, 1937, **34**, 496—501).—The physical properties of natural and artificial gems and the methods of measuring these properties are described. D. R. D.

Mineralogic study of silicosis. R. C. EMMONS and R. WILCOX (Amer. Min., 1937, **22**, 256—267).—The amounts of SiO_2 extracted from various minerals such as sericite, biotite, asbestos, quartz, talc, etc. of particle size 1 to 10μ by human or ox serum at $37.5^\circ \pm 0.5^\circ$ over a period of 2 months have been determined. A theory of the cause of silicosis, based on the presence of colloidal SiO_2 in the lung, and the possible beneficial effects of protecting dusts by flocculation of the dispersed SiO_2 in the lung, are discussed. L. S. T.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

OCTOBER, 1937.

Interferometer wave-lengths in the secondary spectrum of hydrogen. R. G. LACOUNT and R. E. HODGON (Physical Rev., 1937, [ii], 52, 98—99).—Measurements accurate to ± 0.0003 Å. for 34 lines in the range $\lambda\lambda$ 3750—4200 are tabulated.

N. M. B.

Bands of HD and D₂ ending on the $2p^1\Sigma$ state. G. H. DIEKE and (Miss) M. N. LEWIS (Physical Rev., 1937, [ii], 52, 100—125).—Full data for the extensive systems originating from $3d^1\Sigma$ and $3d^1\Pi$ and for some weaker and less complete systems are tabulated. The H, consts. of all the states concerned are recalcd. and the consts. and properties of the states are examined from a comparison of the three isotopic mols.

N. M. B.

New intensity dissymmetry of the Stark effect components of hydrogen. N. RYDE (Naturwiss., 1937, 25, 494).—With an electric field of 150—500 kv. per cm. a considerable dissymmetry of intensity of H β , which is not affected by the conditions of excitation, was observed.

A. J. M.

Intensity measurements in the spectrum of helium. H. C. BURGER, J. B. VAN MILLAN, and L. S. ORNSTEIN (Physica, 1937, 4, 730—732).—Intensity measurements for $\lambda\lambda$ 4472, 17003, 3965, and 15088 Å. are recorded.

H. J. E.

Phases of splitting and field strength relationships for the combined Zeeman and Stark effects of helium lines. W. STEUBING and F. STOLFE (Ann. Physik, 1937, [v], 30, 1—33; cf. A., 1935, 1437).—Three phases of splitting have been observed in the combined Zeeman and Stark effects of He. These are determined by the ratio of the electric and magnetic fields and are separated by two crit. vals. at which sharp splitting different from either the pure Stark or Zeeman effect was observed. Intermediate states show broadened and diffuse components.

O. D. S.

Anode drop in the rare gases helium, neon, and argon. M. J. DRUYVESTYEN (Physica, 1937, 4, 669—682).

H. J. E.

[1, 2] band and predissociation of the $c^3\Pi$ level of the second positive group of N₂. P. TRAUTTEUR (Nuovo Cim., 1937, 14, 222—227).—The higher terms of the [1, 2] band of the second positive group of N₂ have been observed. In the low-pressure arc the rotational levels up to $J = 71$ are excited. The existence of predissociation is confirmed.

O. J. W.

Nuclear moments of aluminium. D. A. JACKSON and H. KUHN (Nature, 1937, 140, 110).—

Measurements of the intensity of the components in the hyperfine structure of certain absorption and emission lines give a val. of 9/2 for the nuclear spin of Al, which disagrees with the val. of 1/2 suggested by Ritschl (A., 1933, 199). The magnetic moment, calc. from Goudsmit's formula, is 3.6 to 4.1 nuclear magnetons.

L. S. T.

Continuous absorption spectrum of chlorine in the region 4000—5000 Å. R. G. AICKIN and N. S. BAYLISS (Trans. Faraday Soc., 1937, 33, 1333—1338).—The absorption coeffs. of Cl₂ over the region 4000—5400 Å. have been measured at 18—709°. The continuous spectrum contains two components. The stronger (A) has $\epsilon_{\max.} = 66$ at 3300 Å. and is due to the transition $^1\Pi_u \leftarrow ^1\Sigma_g^+$ leading to dissociation into normal atoms, whilst the other (B) has $\epsilon_{\max.}$ approx. 1 at about 4250 Å. and is a composite of transitions $^3\Pi_u \leftarrow ^1\Sigma_g^+$ and $^3\Pi_{ou} \leftarrow ^1\Sigma_g^+$ (corresponding with the visible bands) and producing dissociation into Cl ($^2P_{1/2}$) + Cl ($^2P_{1/2}$) and Cl ($^2P_{1/2}$) + Cl ($^2P_{1/2}$), respectively.

J. W. S.

Depolarisation factor of the light diffused by argon. A. ROUSSET. The depolarisation factor of A illuminated by plane polarised light is 3×10^{-4} .

R. S. B.

Negative terms and broad lines in the neutral calcium spectrum. H. E. WHITE (Physical Rev., 1936, [ii], 49, 204—205).—No broad lines due to the combination of negative with lower terms could be detected.

L. S. T.

Deep terms in the spectra of Sc VIII and Sc IX. P. G. KRUGER and L. W. PHILLIPS (Physical Rev., 1937, [ii], 52, 97—98).—Spectrograms previously discussed (cf. this vol., 436) show 23 lines identified as radiations connecting higher terms with the ground states of Sc VIII and Sc IX.

N. M. B.

Variations of intensity in titanium and vanadium lines, caused by the introduction of sodium and potassium salts into the arc. S. A. BOROVIK and T. T. BOROVIK-ROMANOVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 543—546).—The intensities of four lines of at. Ti are increased by the presence of foreign substances in the C arc in the order: Pb₃O₄ < K₂CO₃ < SiO₂ < NaCl < KCl; in the case of four lines of ionised Ti the order is NaCl, SiO₂ > Pb₃O₄ > K₂CO₃. KCl has a depressant action. The intensities of three lines of at. V are considerably raised by KCl and NaCl, whereas those of five lines of ionised V are unaffected by NaCl, and reduced by KCl.

R. C. M.

Hyperfine structure of the λ 4336.89, sp^3d_2 — Sp^3d_1 line in the first spark spectrum of arsenic

and its nuclear spin. S. K. MUKERJI (Indian J. Physics, 1937, 11, 213—217).—The λ 4336.89 line in the first spark spectrum of As is a regular quartet degraded towards the ultra-violet; the nuclear spin of As is $3/2$. F. J. L.

Effect of magnetic field on the absorption of selenium. S. ROUFFERT (Compt. rend., 1937, 204, 1723—1725).—The absorption spectrum of Se vapour at 615 – 630° shows an increase under a magnetic field of 24,400 gauss. R. S. B.

Pressure shift of spectral lines. H. KUHN (Physical Rev., 1937, [ii], 52, 133; cf. this vol., 272).—A test of the statistical theory by comparison of observed and calc. data for 30 lines in the visible region of Kr shows good agreement. N. M. B.

Band spectra and energy of dissociation of the rubidium molecule. N. T. ZÉ and T. S. TSIANG (Physical Rev., 1937, [ii], 52, 91—96; cf. Kusch, A., 1936, 397).—Data and analyses for 118 bands of the violet and 160 bands of the blue system of Rb_2 in absorption. The upper vibrational frequencies are 40.42 and 36.46 cm^{-1} , respectively. The lower level, common to both systems, is the ground state, and its vibrational frequency 57.45 cm^{-1} . The energy of dissociation of the ground state is 0.49 ± 0.02 volt. A green edge of the blue system at 5032 Å. has been observed. N. M. B.

Hyperfine structure of the resonance lines of rubidium. A. V. HOLLENBERG (Physical Rev., 1937, [ii], 52, 139).—The resonance lines λ 7800 and λ 7947 were photographed with two experimental arrangements. Hyperfine structure patterns are given, components are ascribed to ^{85}Rb and ^{87}Rb present in the ratio 3:1, and consts. are calc. N. M. B.

Gradient of the high-pressure discharge in various metal vapours. W. ELENBAAS (Physica, 1937, 4, 747—751).—Data for discharges in Cd and Zn are recorded. H. J. E.

Extreme ultra-violet spectrum of antimony. L. BLOCH and E. BLOCH (J. Phys. Radium, 1937, [vii], 8, 217—228).—The spectrum of Sb, excited by an electrodeless discharge, is recorded between 200 and 2400 Å. and agrees with recorded data. Many new lines are given. By comparing plates for different excitations separation of the spectrum into Sb I, Sb II, Sb III, Sb IV, and Sb V is made. Assignments agree with those previously given; new lines are assigned. The presence of lines of Sb VI is postulated. An analysis of the Sb VI spectrum enables the Te VII spectrum (this vol., 335) to be analysed and a comparison of isoelectronic spectra is made. W. R. A.

Zeeman effects in the spectrum of Sa II. W. ALBERTSON and A. S. KING (Physical Rev., 1936, [ii], 49, 209).—Measurements of the n components of 300 lines of Sa II in a field of 31,100 gauss show that the low levels of Sa II have good LS coupling, whilst the high levels are markedly perturbed. L. S. T.

Spectra of Sa II and Gd I. W. ALBERTSON (Physical Rev., 1936, [ii], 49, 208; cf. this vol., 103). L. S. T.

Arc and spark spectra of lutecium. W. F. MEGGERS and B. F. SCRIBNER (J. Res. Nat. Bur. Stand., 1937, 19, 31—39).—Data obtained between λ 2000 and 11,000 Å. are recorded and discussed. C. R. H.

Fine structure of the luminous flashes produced by the discharge of a condenser through a tube of gas. M. LAPORTE and P. CORDA (J. Phys. Radium, 1937, [vii], 8, 233—234; cf. A., 1936, 538).—Results for pure inert gases and their binary mixtures and for Hg-A mixtures are given and discussed. W. R. A.

Test of the interval rule in the $^2D_{3/2}$ state of Bi I. E. U. MINTZ and L. P. GRANATH (Physical Rev., 1936, [ii], 49, 196).—Measurements of the intervals between the six hyperfine structure components of the line 4722.5 Å. in the arc spectrum of Bi reveal a deviation from the Landé interval rule in the $^2D_{3/2}$ state. L. S. T.

Lowering of spark potential of the inert gases by irradiation. R. SCHADE (Naturwiss., 1937, 25, 568—569; cf. this vol., 55).—The previous explanation of this phenomenon is untenable. Processes which were previously described as space-charge effects are now supposed to be of a cumulative kind depending on the c.d. A. J. M.

Stratified Geissler discharge in various gases at atmospheric pressure. J. JAFFRAY (Compt. rend., 1937, 205, 32—33).—The effect has been observed with CO, impure CH_4 , and air containing a trace of turpentine. The discharge is preceded by a feeble disruptive spark. On reducing the pressure, the positive column shortens, the dark space lengthens, and the luminous mantle gradually extends to the cathode. C. R. H.

Low-pressure arc characteristics. J. D. COBINE (Physical Rev., 1936, [ii], 49, 479).—For air, N_2 , O_2 , and CO_2 the re-ignition potential of the short a.c. arc between pure graphite electrodes is a linear function of the gas pressure. Factors affecting re-ignition and a possible mechanism are discussed. L. S. T.

Mechanism of the discharge in a Siemens ozone tube. A. KLEMENC, H. HINTENBERGER, and H. HÖFER (Z. Elektrochem., 1937, 43, 708—712; cf. this vol., 273).—Examination with a cathode-ray oscillograph indicates that the current through the ozoniser comprises strong pulses of short duration occurring every half cycle of the applied a.c. potential. No high-frequency oscillations could be detected. J. W. S.

Transition from ordinary glow discharge to multi-spark discharge with increasing thickness of the electrolytic oxide layer on aluminium. A. GÜNTHER-SCHULZE and W. BÄR (Z. Physik, 1937, 106, 662—668).—Multi-spark discharge from oxide-coated Al cannot be obtained with borate-formed layers. Forming in 5% $\text{H}_2\text{C}_2\text{O}_4$ gives thicker porous layers from which multi-spark discharge occurs. Current-voltage curves, from test-plate measurements, show that multi-spark discharge begins with layers 2μ thick and is complete at 10μ thick. The field strength in the oxide layer decreases with increasing

thickness. Ta_2O_5 layers show no sign of multi-spark discharge. L. G. G.

Theory of radiation of a gaseous discharge. V. FABRIKANT (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 451—455).—A method for calculating the total intensity of radiation in a discharge such that secondary processes can be neglected, where electron concn. and temp. are known, is developed. The theory agrees with the results of Druyvesteyn and Warmoltz (A., 1934, 124) for a Na discharge. O. D. S.

Spectral classification of the stars of types A to K. W. W. MORGAN (Astrophys. J., 1937, 85, 380—397). L. S. T.

Nuclear K electron capture. L. W. ALVAREZ (Physical Rev., 1937, [ii], 52, 134—135).—An attempt to test the consequence of the Fermi theory of β -decay that positron-active nuclei may capture at. electrons instead of emitting positrons was made by detecting the X -rays which would result from the refilling of the K shell using a Ra-V source and counter method and correction for γ -radiation and absorption. The ratio of probabilities of K electron capture and positron emission is 1.0 ± 0.4 , and is of the order of magnitude predicted by theory. N. M. B.

Intensity variation of L series X -ray lines with tube voltage. G. H. BANCROFT (Physical Rev., 1937, [ii], 52, 6—11).—Investigation with a Cu target showed a marked increase in the slope of the intensity-applied voltage curve immediately after the excitation of the K state. Intensity plotted against the square of the voltage difference between the K excitation and applied voltages gives an approx. straight line in agreement with theory. N. M. B.

L emission and absorption spectra of rhenium and its characteristic levels. (MILLER) Y. CAUCHOIS (J. Phys. Radium, 1937, [vii], 8, 267—272; cf. A., 1936, 1169; this vol., 159).— L emission and L absorption spectra of Re have been investigated and the energies of electronic levels determined. W. R. A.

L emission and absorption spectra of radium. Characteristic levels. H. HULUBER (J. Phys. Radium, 1937, [vii], 8, 260—266; cf. A., 1936, 1169, 1311, 1438).—The L emission and L absorption spectra of Ra have been investigated and the energies of different electronic levels determined. W. R. A.

Half-value widths of X -ray interference lines. H. MÖLLER and A. ROTH (Mitt. Kaiser-Wilh.-Inst. Eisenforsch., 1937, 19, 123—126).—The determination of the half-val. widths of X -ray interference lines by examination of photographs by registering photometers is discussed. The connexion between electrometer reading, blackening of film, and X -ray intensity is obtained, thus making it possible to transform photometer curves into X -ray intensity curves. From the latter the half-val. width can be determined independently of time of irradiation. The results are independent of the temp. and period of use of the photographic developer within the limits of 17 — 22° , and up to 3 months, respectively. A. J. M.

Double Compton scattering. F. BOPP (Ann. Physik, 1937, [v], 30, 35—71; cf. A., 1936, 1439).—

Mathematical. The spectral distribution and total intensity of double Compton scattering are calc. for two cases in which the incident and scattered ray are symmetrical with respect to the scattering plate. Unexpectedly high vals. of intensity are obtained for Pb and Al, even for small thicknesses of the scattering medium. The theory is applied to the results of Gentner (A., 1936, 918). O. D. S.

Origin of satellite lines in X -ray spectra. L. PINCHERLE (Nuovo Cim., 1937, 14, 185—195).—All the most intense satellite lines in X -ray spectra are due to multiple ionisation. The intensities of satellite lines due to double electronic transitions are in general too small to be observed, but may become important in the spectra of light elements. O. J. W.

Photo-thermionic effect in incandescent metals. I. RANZI and R. RICAMO (Nuovo Cim., 1937, 14, 114—118).—By means of experiments with light of various colours it is shown that the photo-thermionic effect obtained with white light on W filaments is a purely thermal effect. In the case of cathodes consisting of alkaline-earth oxides the effect with white light is partly photo-electric. O. J. W.

Fowler's photo-electric theory, assuming quantum absorption probability a function of electronic energy. A. T. WATERMAN (Physical Rev., 1936, [ii], 49, 410).—Theoretical. L. S. T.

Ionisation energy of Li^+ and He. H. A. S. ERIKSSON (Nature, 1937, 140, 151).—The application of certain corrections to the calc. val. for the ionisation potential of Li^+ gives a val. of $610,100 \text{ cm}^{-1}$ (experimental val. $610,079 \pm 25 \text{ cm}^{-1}$). For He, the calc. val. is $198,325 \text{ cm}^{-1}$ (experimental $198,305 \pm 15 \text{ cm}^{-1}$). L. S. T.

Ionisation of neon, krypton, and xenon by bombardment with accelerated neutral argon atoms. H. WAYLAND (Physical Rev., 1937, [ii], 52, 31—37; cf. Beeck, A., 1930, 1494).—Investigations by an electrometer method and curves obtained gave positive evidence of ionisation. Onset potentials for ionisation are: Xe bombarded by A, 55 volts; Kr by A, 50 volts; Ne by A, 130 volts approx. N. M. B.

Absorption of high-energy electrons. I. J. J. TURIN and H. R. CRANE (Physical Rev., 1937, [ii], 52, 63—67).—The losses in passing through an absorber, given by the curvatures of the incident and emergent tracks, when the recoil electrons produced by 6 m.e.v. γ -radiation from F bombarded by protons passed through 5-mm. C and 0.5-mm. Pb absorbers were in good agreement with the theoretical losses due to electron collision alone. Radiative losses in the case of low at. no. C are negligible, but in the case of Pb are considerable. N. M. B.

Spectrographic study of the conductivity electrons in magnesium-aluminium alloys. J. FARI-NEAU (Compt. rend., 1937, 205, 365—366; cf. A., 1936, 1311; this vol., 337).—The K emission spectra of Al_2Mg_3 and Al_3Mg_2 are similar to those of the pure metals excepting in the bands, the width of which is $>$ for the pure metals. The intensity distribution within the bands is in accord with the assumption that the conductivity electrons are held in common

and can fall to a K level on either an Al^{+++} or Mg^{++} ion. The band widths are slightly $>$ the vals. calc. on the assumption that the valency electrons obey Fermi statistics. J. W. S.

Maximum in secondary electron emission from metals. D. R. BHAWALKAR (Proc. Indian Acad. Sci., 1937, 6, A, 74—78).—Theoretical. The presence of the max. in secondary electron emission curves is explained on the assumption that the rate of loss of energy obeys the Thomson-Whiddington law, and that secondary electrons are absorbed by the target on their way out. C. R. H.

Calculation of the mean ionic energy of gases. E. BAGGE (Ann. Physik, 1937, [v], 30, 72—90).—An equation for the velocity distribution of secondary electrons from gas atoms, and an approx. formula for the differential ionisation of gases, are deduced and are in agreement with experiment. Mean ionic energies are calc. as follows: for 20 kv. energy, H 33.9, N_2 28.6, and Ne 42.2 volts. O. D. S.

Capture of orbital electrons. F. HOYLE (Nature, 1937, 140, 235—236).—Theoretical. L. S. T.

Scattering of fast electrons in hydrogen. A. L. HUGHES and S. S. WEST (Physical Rev., 1937, [ii], 52, 43—45; cf. A., 1936, 1170).—The classical and the wave theories lead to different expressions for the probability of scattering of particles by similar particles, and hence to a difference in the ratio of the no. of inelastically to the no. of elastically scattered electrons. Experimental results are in closer agreement with wave-theory predictions. A slight difference between experimental results for H_2 and He is probably due to diffraction effects in scattering by diat. mols. N. M. B.

Production of positron and electron pairs by bombardment of mercury with β -particles of low energy. F. C. CHAMPION and A. BARBER (Nature, 1937, 140, 105).—Examination of many photographs of the tracks of β -particles from Ra-E in a mixture of 5% of $HgMe_2$ and 95% of N_2 has revealed two definite cases of the production of pairs of positrons and electrons by β -particles of energy slightly >1 m.v. A comparison with previous results (A., 1935, 425; 1936, 401) indicates that the probability of pair production by β -particles of low energy increases rapidly with at. no., and is large when the energy of the β -particle is of the order $2 mc^2$. L. S. T.

Magnetic spectrum of positrons generated in lead by thorium-C'' γ -rays. G. L. LOCHER and C. L. HAINES (Physical Rev., 1936, [ii], 49, 198).—Results obtained with a specially-constructed β -ray spectrograph are recorded. L. S. T.

Secondary processes of ionisation in mercury vapour. B. L. SNAVELY (Physical Rev., 1937, [ii], 52, 174—183).—Ionisation due to the impact of electrons of energy <10.4 volts was investigated as a function of electron velocity bombarding current, and pressure of Hg vapour. For velocities >7 volts data correspond with ionisation of metastable atoms by electron impact. Crit. potentials at 8.4, 8.6, and 6.9 volts are identified. Large nos. of

negative ions around 4.9 volts probably indicate ionisation due to the simultaneous formation of a positive and a negative ion on the collision of a 2^3P_0 with a 2^3P_1 atom. N. M. B.

Collector theory for ions with Maxwellian and drift velocities. A. H. HEATLEY (Physical Rev., 1937, [ii], 52, 235—238).—For a gaseous discharge in which the ions have a drift velocity superimposed on a Maxwellian distribution, the removal of the restriction, in the Mott-Smith-Langmuir theory, to collectors having a high ratio of sheath to collector diameters is examined. N. M. B.

Magnetic focussing of ion beams. H. A. STRAUS (Physical Rev., 1937, [ii], 52, 128—130).—The effect of the angle of incidence on the position of the focus when the ion beam enters the field along a line other than the field normal was investigated, and results are in satisfactory agreement with theory. N. M. B.

Emission of positive ions at low temperatures. M. A. SFORZINI-PIEROTTI (Nuovo Cim., 1937, 14, 8—13).—The emission of positive ions from a W filament commences at 170° . These are probably ions of alkali metals occluded in the W. With Pt quite a marked emission occurs at 50° . O. J. W.

Range of protons in aluminium and in air. D. B. PARKINSON, R. G. HERB, J. C. BELLAMY, and C. M. HUDSON (Physical Rev., 1937, [ii], 52, 75—79).—Using a 2×10^6 volt generator the range of protons in air, r_a , and in Al, r_{Al} , was measured as a function of proton energy >2 m.e.v. Results in air agree well with the theoretical results of Mano (cf. A., 1935, 275) at high energies, but diverge considerably at energies <0.7 m.e.v. r_a/r_{Al} increases from approx. 1000 at 200 kv. to 1550 at 1200 kv., and thence to the max. voltage remains nearly const. N. M. B.

Ionic recombination in the ionosphere. L. B. LOEB (Physical Rev., 1937, [ii], 52, 136; cf. this vol., 437).—A correction. N. M. B.

Mass-ratio of the lithium isotopes. F. A. JENKINS and A. McKELLAR (Physical Rev., 1936, [ii], 49, 205).—New measurements of the red band system of Li_2 give for the isotopic mass-coeff. $\omega''/\omega' = 1.04100$ and $= 1.04107$ compared with the vals. 1.04141 given by the blue-green system and 1.04077 obtained by Almy and Irwin (A., 1936, 264). L. S. T.

Packing fractions of krypton and xenon. F. W. ASTON (Nature, 1937, 140, 149).—Direct and more accurate (A., 1927, 914) measurements of the packing fractions have been made by comparison with hydrocarbon doublets. The packing fractions and isotopic wts. deduced from H 1.00812 and C 12.00355 are: $^{78}Kr -7.30$, 77.9430 ± 0.0020 ; $^{82}Kr -7.70$, 81.9369 ± 0.0015 ; $^{84}Kr -7.60$, 83.9362 ± 0.0015 ; $^{86}Kr -7.40$, 85.9363 ± 0.0015 ; $^{129}Xe -4.46$, 128.9424 ± 0.0020 ; and ^{132}Xe (provisional) -4.4 , 131.942 , respectively. L. S. T.

Further investigations of the atmospheric ionisation associated with rainfall. G. R. WATT and A. G. McNISH (Physical Rev., 1936, [ii], 49, 201).—Previous findings that the increased ionisation

produced in the atm. by rainfall is due to radioactive matter, chiefly Ra-B and -C, brought down by rain, are confirmed. L. S. T.

Radioactivity of potassium prepared from animal tissue. A. LASNITZKI and E. A. OESER (J.C.S., 1937, 1090—1091).—The radioactivity of K from the muscular tissue of rabbits is equal to that of K of mineral origin, within the limits of experimental error (2%) (cf. A., 1934, 1028). J. G. A. G.

Yield of thoron by the "gas-flow" method. R. DUCHON (J. Phys. Radium, 1937, [vii], 8, 285—293).—The yield of thoron has been investigated by a gas-flow method using both open and closed circuits. The influence of factors such as temp., rate of flow, etc. has been determined. The theoretical treatment of the method accords well with experimental data. W. R. A.

Range of the α -particles from thorium. G. H. HENDERSON and G. C. LAURENCE (Physical Rev., 1937, [ii], 52, 46—47).—Recent vals. of this range are discussed. The results of Kurie (cf. A., 1933, 443) are criticised. N. M. B.

α -Ray standards. H. STOILMANN (Physikal. Z., 1937, 38, 645—654).—The construction of α -ray standards (i.e., apparatus to furnish a definite current under given conditions) using U_3O_8 is described. Apparatus is described in which the current is independent of air pressure and potential >1800 volts, and another in which the current \propto air pressure. A. J. M.

Possibility of a dual β -disintegration of potassium. C. F. VON WEIZSÄCKER (Physikal. Z., 1937, 38, 623—624).—The radioactivity of K is due to ^{40}K , which has two stable isobars, ^{40}Ca and ^{40}Ar . The normal radioactivity of ^{40}K is ascribed to the transformation into ^{40}Ca , but transition into ^{40}Ar is also possible. It is suggested that practically all the ^{40}K in the atm. is a disintegration product of K, explaining the fact that Ar is about 1000 times as abundant in the atm. as it should be when considered in connexion with the abundance of other elements. When the amount of ^{40}K is subtracted from the total, Ar falls into its proper place in the abundance-at. no. curve. Consideration of the relative abundance of the inert gases makes it possible to calculate approx. the ratio of ^{40}Ca and ^{40}Ar derived from K. Approx. 1 in 3 ^{40}K nuclei gives ^{40}Ar . Both disintegrations have abnormally long half-life periods. A. J. M.

Ionisation by gamma rays and Röntgen rays in argon at high pressures. An absolute dose-meter. J. CLAY and G. VAN KLEEF (Physica, 1937, 4, 651—658).—An Al collecting chamber of 2.7 c.c. capacity, with automatic recording, is described. H. J. E.

Measurement of γ -ray energies with a cloud chamber. J. R. RICHARDSON and F. N. D. KURIE (Physical Rev., 1936, [ii], 49, 209).—The best conditions and the most trustworthy method of measurement are discussed. L. S. T.

γ spectrum of Ra-B and Rd-Ac. S. ROSENBLUM and M. GUILLLOT (Compt. rend., 1937, 204, 1727—1729).—Theoretical. The radiations from Ra-

B and Rd-Ac are compared and shown to obey similar numerical relations. R. S. B.

Energy of the γ -rays of radioindium and radio-manganese. A. C. G. MITCHELL and L. M. LANGER (Physical Rev., 1937, [ii], 52, 137).—Curves for the absorption of the γ -rays in Al are given and an energy expression is obtained. The average energies are 1.39 and 1.65 m.e.v., respectively. The absorption of the rays and of those of Th-C'' in Pb and Cu was measured. The rays are monochromatic and of the same period as that of the β -activity (cf. A., 1936, 1441). N. M. B.

Number of neutrons emitted by a radium-beryllium source. C. J. BAKKER (Physica, 1937, 4, 723—729).—The no. of neutrons was $(2.1 \pm 0.2) \times 10^4$ per sec. per m.C. of Ra. H. J. E.

Simultaneous ejection of three neutrons from elements bombarded with fast neutrons. M. L. POOL, J. M. CORK, and R. L. THORNTON (Physical Rev., 1937, [ii], 52, 41; cf. this vol., 389).—Evidence of three-neutron emission in the case of Sc, and possibly in the cases of Cu and F, is discussed. The reaction for Sc is $^{46}Sc + n \rightarrow ^{43}Sc + n + n + n$. N. M. B.

Effects of long-range forces on neutron-proton scattering. S. S. SHARE and J. R. STEHN (Physical Rev., 1937, [ii], 52, 48—51).—A possible explanation of discordant experimental results on the angular distribution of fast neutrons scattered by protons is proposed. N. M. B.

Scattering of neutrons by deuterons. L. I. SCHIFF (Physical Rev., 1937, [ii], 52, 149—154; cf. this vol., 391).—Mathematical. N. M. B.

Capture of thermal neutrons by deuterons. L. I. SCHIFF (Physical Rev., 1937, [ii], 52, 242; cf. preceding abstract).—Mathematical. Calculations for this process are given. The capture cross-section is 0.3×10^{-26} sq. cm., well within the observed upper limit 3×10^{-26} sq. cm., and indicates that capture is too improbable for experimental observation. N. M. B.

Scattering of slow neutrons by liquid ortho- and para-hydrogen. J. HALPERN, I. ESTERMANN, O. C. SIMPSON, and O. STERN (Physical Rev., 1937, [ii], 52, 142).—Scattering of slow neutrons (90° abs.) is greater by ortho- than by para- H_2 , as predicted by theory (cf. Schwinger, this vol., 339). Approx. data show that the mean free path of the neutrons in ortho- H_2 is about the same as in H_2O but much larger in para- H_2 . N. M. B.

Production and absorption of slow neutrons in hydrogenic materials. G. A. FINK, J. R. DUNNING, G. B. PEGRAM, and E. SEGRE (Physical Rev., 1936, [iii], 49, 199).—Relative data for the no. of slow neutrons emerging from zones at the end of a paraffin cylinder are given. The no. of neutrons emerging from a Rn-Be source placed in the centre of cylinders of different size containing H_2O have been determined. The mean life time calc. for a neutron in paraffin is $\sim 10^{-4}$ sec. L. S. T.

Magnetic scattering of slow neutrons. O. HALPERN and M. H. JOHNSON, jun. (Physical Rev.,

1937, [ii], 52, 52—53).—It is suggested that the contribution of at. or ionic magnetic moments to the cross-section for the scattering of slow neutrons may be separated from that due to nuclear scattering by a comparison of the scattering of a metal with the scattering from the corresponding ions of different valency, and that this magnetic scattering, in unmagnetised paramagnetic bodies, should be several times > nuclear scattering. N. M. B.

Absorption coefficients for thermal neutrons.

(A) C. T. ZAHN. (B) O. LAPORTE (Physical Rev., 1937, [ii], 52, 67—71, 72—74).—(A) Mathematical. Integrals arising in the interpretation of experiments are expressed as convenient series for evaluation and numerical data are tabulated.

(B) The integrals are discussed for larger vals. of the independent variable. N. M. B.

Energies of nuclear disintegration. L. GOLDSTEIN (J. Phys. Radium, 1937, [viii], 8, 235—240).—Theoretical. Corrections necessary to account for all the energy associated with a nuclear transformation are discussed, more particularly in respect of natural α -radioactivity. W. R. A.

Sargent curves for artificially radioactive substances. A. C. G. MITCHELL (Physical Rev., 1937, [ii], 52, 1—5).—Points plotted for a no. of elements, the end-points of which were determined by extrapolation of the Konopinski-Uhlenbeck curves, lie approx. on three smooth curves agreeing in shape with the predictions of that theory. Relative vals. for the transition matrix moments are obtained and the spins of radioactive elements are discussed. N. M. B.

Recoil atoms of radioactive bodies. L. GOLDSTEIN (J. Phys. Radium, 1937, [vii], 8, 316—320).—Mathematical. A consideration of the effects produced within a radioactive atom when it emits charged particles. The probabilities that the atom is left in an excited or an ionised state are discussed.

W. R. A.

Radioactivity produced by high-energy neutron bombardment. M. L. POOL, J. M. CORK, and R. L. THORNTON (Physical Rev., 1937, [ii], 52, 239—240).—A tabular summary of available data for period, intensity, sign, and assignment for all elements investigated. N. M. B.

Artificial radioactivity produced by α -particles. W. J. HENDERSON and L. N. RIDENOUR (Physical Rev., 1937, [ii], 52, 40; cf. this vol., 439).—A method of obtaining enhanced activities is described. Provisional identifications, half-life, and emissions accompanying decay are: from Cr, ^{55}Fe , 8.9 min., positrons, and ^{56}Mn , 160 min., negative electrons; from Co, ^{62}Cu , 10.0 min., positrons; from Cu, ^{68}Ga , 68 min., positrons, and ^{66}Ga , 9.4 hr., positrons; from As, ^{78}Br , 6.3 min. N. M. B.

Artificial radioactivity produced by α -particles. L. N. RIDENOUR and W. J. HENDERSON (Physical Rev., 1937, [ii], 52, 139; cf. this vol., 439).—Direct bombardment of Ni with α -particles confirms the presence of a product of half-life 37 min., attributed to ^{63}Zn , and separable from the much stronger ^{61}Cu . The corr. relative initial intensities

are $^{61}\text{Cu} : ^{63}\text{Zn} = 1.9 : 10$ (cf. Thornton, this vol., 439). N. M. B.

Angular distribution of the disintegration particles in the transmutation of light atomic nuclei by hydrogen positive rays. II. H. NEUBERT (Physikal. Z., 1937, 38, 618—622; cf. this vol., 161).—The angular distribution of the disintegration particles produced in the reactions $^7\text{Li} + ^1\text{H} \rightarrow ^8\text{Be} + ^4\text{He}$, $^{11}\text{B} + ^1\text{H} \rightarrow ^3\text{He}$, and $^6\text{Li} + ^1\text{H} \rightarrow ^4\text{He} + ^2\text{He}$ has been further examined. The distribution of particles in the first reaction was measured up to an angle of 20° with the direction of the protons, the no. of particles at this angle being approx. twice that at 90° . For the second reaction the angular distribution curves for emitted α -particles of range > 20 mm. was determined for angles between 20° and 110° . The form of the curve is dependent on the range of the α -particles. For the last reaction there is uniform angular distribution of α -particles between 90° and 150° . A. J. M.

Positrons from deuteron-activated phosphorus. H. G. PAXTON (Physical Rev., 1936, [ii], 49, 206).—Approx. one positron was observed for each 50 electrons from ^{32}P ; half-life period 50 ± 10 hr. The energy distribution appears to have the form of a disintegration spectrum with an upper limit at approx. 0.6 mv. L. S. T.

Radioactive isotopes of (A) manganese, iron, and cobalt. J. J. LIVINGOOD, F. FAIRBROTHER, and G. T. SEABORG. (B) Antimony. J. J. LIVINGOOD and G. T. SEABORG (Physical Rev., 1937, [ii], 52, 135, 135—136).—(A) Fe bombarded with 5.5 m.e.v. deuterons gives a negative electron activity of approx. 40 days half-life in the fraction after pptn. as $\text{Fe}(\text{OH})_3$ or extraction as FeCl_3 . A similar Fe activity was separated from CoO bombarded over long periods with neutrons, and this Fe fraction, after deuteron bombardment, contains an 18 hr. positron emitter and a complex of half-life 100—200 days (cf. Sampson, A., 1936, 1172). The deuteron-bombarded Fe shows, in the Mn ppt., a positron emitter of about 5 days' half-life and a negative electron emitter of several months' period, as well as the 2.5-hr. activity of ^{56}Mn , even from very pure Fe. A Mn positron emitter of 46 min. half-life is produced when Cr is bombarded with deuterons.

(B) Sb bombarded with slow neutrons and 5.5 m.e.v. deuterons gives an activity of approx. 60 days half-life, and a 2.5-day period. Both are negative electron emitters and are attributed to ^{122}Sb and ^{124}Sb . Results confirm available data. Sb bombarded with fast neutrons gives ^{120}Sb , 16 min. half-life, and Sn bombarded with deuterons gives the same product. N. M. B.

Radioactive arsenic. P. HARTECK, F. KNAUER, and W. SCHAEFFER (Naturwiss., 1937, 25, 477).—The disintegration products of As activated by slow neutrons were β -particles, and a few positrons, some paired. As has an anomalous β -spectrum, the limit being at 3.4×10^6 e.v., and the max. approx. 9×10^6 e.v. It is considered that the analysis of the β -spectrum into two portions is not justified. The positrons probably arise from the process $^{73}\text{As} \rightarrow ^{76}\text{Ge} + e^+$. A. J. M.

Artificial radioactivity induced in arsenic, nickel, and cobalt under deuteron bombardment. R. L. THORNTON (Physical Rev., 1936, [ii], 49, 207).—Bombardment of As, sublimed on Al, with 4.3 m.e.v. deuterons gives a 2.5 hr.-period activity ascribed to Si in the Al base, and an activity of 27 ± 1 hr. period due to ^{76}As . Strong γ -rays, less energetic than those of radio-Na, accompany this activity. Absorption measurements on the disintegration electrons indicate a max. energy of 1.5 m.e.v. Bombardment of Ni foil with 5.2 m.e.v. deuterons gave periods of 10 min. and 3.5 ± 0.1 hr.; the former is probably due to contamination by C. Bombardment of Co with 4.3 m.e.v. deuterons gave activities of 10 min. (probably contamination by C), 3.6 hr., and one or more activities of periods $>$ a day.

L. S. T.

Radioactive isotopes of element 43. C. PERRIER and E. SEGRÈ (Nature, 1937, 140, 193—194).—A strong activity produced in Mo irradiated with deuterons in the cyclotron is probably due to isotopes of at. no. 43. This element shows the same reactions with H_2S , nitron, etc. as Re, from which it can be separated by the method of Geilmann and Weibke for the separation of Mo and Re.

L. S. T.

Ionisation by γ -rays and cosmic rays in gases at high pressure and high collecting fields. J. CLAY (Physical Rev., 1937, [ii], 52, 143—148).—In measurements at high pressures (cf. Physica, 1935, 2, 825) there was no vol. recombination, and results are independent of those of Bowen (cf. this vol., 211). Investigations in air and A for γ -rays and cosmic rays indicate that for all pressures the vol. ionisation \propto the pressure and that ionisation produced by electrons ejected from the wall is, for high pressures, independent of the pressure, in agreement with theory.

N. M. B.

Specific ionisation in air for cosmic rays and gamma rays. J. CLAY (Physica, 1937, 4, 645—647).—The val. of $N_{0\gamma}/N_{0c}$ at 38 atm. was 3.3.

H. J. E.

Determination of Eve's constant as proof for the saturation of the ionisation in air at high pressures. J. CLAY and M. A. v. TIJN (Physica, 1937, 4, 648—650).

H. J. E.

Cosmic rays and the earth magnetic field. II. E. M. BRUINS (Physica, 1937, 4, 659—666).—Earth magnetic effects cannot be explained by assuming a single dipole. Local magnetic disturbances have an effect on the cosmic ray intensity.

H. J. E.

Cosmic radiation. P. M. S. BLACKETT (J. Soc. Arts, 1937, 85, 893—903, 905—918, 921—931).—Cantor lectures.

Absorption of the soft component of cosmic radiation. W. HETTLER (Nature, 1937, 140, 235).—Theoretical absorption curves for Pb and Al have been calc. on the basis of the quantum theory; they follow approx. an ordinary mass absorption law. The few experimental vals. available fall on the curves.

L. S. T.

Demonstration of neutrons of ultra-radiation in photographic emulsion. E. SCHOPPER (Natur-

wiss., 1937, 25, 557—558).—Traces of protons, liberated by the action of rapid neutrons, were obtained on photographic plates after the passage of ultra-radiation through Pb and paraffin. The presence of slow neutrons was demonstrated by using an emulsion containing B.

A. J. M.

High-altitude measurements on the energies of cosmic-ray tracks. C. D. ANDERSON, R. A. MILLIKAN, and S. H. NEDDERMEYER (Physical Rev., 1936, [ii], 49, 204).—The majority of the tracks measured at Pike's Peak are similar in kind to those at sea level, and can be ascribed to positive and negative electrons. Showers are more frequent and, on the average, larger than those found at sea level. The few heavily ionising positive tracks are interpreted as protons produced by nuclear disintegration.

L. S. T.

Absorption of cosmic-ray electrons at 10,600 ft. and at sea level. R. H. WOODWARD and J. C. STREET (Physical Rev., 1936, [ii], 49, 198).—Counter measurements at Echo Lake, Colorado, 10,600 ft., are compared with those at sea level (A., 1935, 1050).

L. S. T.

Ionic recombination in the ionosphere. L. B. LOEB (Physical Rev., 1937, [ii], 52, 40—41; cf. this vol., 437).—The Thomson mechanism at very low pressures is discussed.

N. M. B.

Emission of electrified particles by the sun and the theory of polar auroræ. D. BARBIER (J. Phys. Radium, 1937, [vii], 8, 303—308).—The penetration of the earth's atm. by aurora-producing particles indicates that the energy of these particles is considerably $>$ that of particles emitted by the sun. This is discussed in relation to the earth's change.

W. R. A.

State of ionisation and the absorption of energy in planetary nebulae. G. G. CILLIÉ (S. African J. Sci., 1937, 33, 136—143).

H. J. E.

Woolley's theory of the hydrogen emission of prominences. G. G. CILLIÉ (S. African J. Sci., 1937, 33, 130—135).

H. J. E.

Nuclear exclusion principle and the neutron-proton pattern. W. D. HARKINS (Physical Rev., 1937, [ii], 52, 39).—A summary and justification of principles developed in recent years with reference to the pattern of 305 at. species now known.

N. M. B.

Neutrons. P. CERNUSCHI (J. Phys. Radium, 1937, [vii], 8, 273—276).—Mathematical. The application of Schrodinger's relativistic equation is made on the basis that a neutron consists of a proton and an electron, but is unacceptable because it leads to only one stable state with a life period of 10^{-27} sec. The elementary particles are the electron, the positron, and the neutron, and on this view the effective cross-section for the photo-electric disintegration of the proton can be calc.

W. R. A.

Fundamental atomic constants. R. T. BURGE (Physical Rev., 1937, [ii], 52, 241).—A discussion of the results of von Friesen (cf. this vol., 441). It is suggested that all vals. of h/e are low.

N. M. B.

Magnetic moment of the proton. L. A. YOUNG (Physical Rev., 1937, [ii], 52, 138).—An attempt to

explain the divergent results of Stern and of Rabi (cf. A., 1936, 1316) on the basis of the theoretical treatment of the two methods employed.

N. M. B.

Sign of the magnetic moment of the neutron. P. N. POWERS, H. CARROLL, H. BEYER, and J. R. DUNNING (Physical Rev., 1937, [ii], 52, 38—39; cf. this vol., 441).—Measurements of the reorientation of neutron spin in a precessing field are reported. The direction of the precessing field giving max. reorientation indicates that the neutron moment is negative. Indications between limits of the magnitude of the moment, as given by the reorientation probability, are in agreement with theory (cf. Schwinger, this vol., 278).

N. M. B.

Sign of the magnetic moment of the ^{39}K nucleus. H. C. TORREY (Physical Rev., 1937, [ii], 52, 30; cf. this vol., 210).—A correction.

N. M. B.

Interaction of two particles in relativistic wave mechanics. J. L. DESTOUCHES (J. Phys. Radium, 1937, [vii], 8, 251—256).—Mathematical. In applying the generalisation of the Lorentz transformation (e.g., A., 1936, 660) it is found that the superposition of forces is an essential condition of relativity. The interaction of two electrons cannot be treated in relativistic theory as a mechanical problem of two particles but requires wave-mechanical treatment.

W. R. A.

First deviation of the ^4He and ^{16}O nuclei from the Hartree model. B. O. GRONBLÖM (Naturwiss., 1937, 25, 526).—Mathematical.

A. J. M.

Calculation of binding energies in light nuclei. W. V. HOUSTON (Physical Rev., 1936, [ii], 49, 206; cf. A., 1936, 1175).

L. S. T.

Interaction of nuclear particles. N. KEMMER (Nature, 1937, 140, 192—193).—Theoretical.

L. S. T.

Recent developments in the study of the [atomic] nucleus. S. A. KORFF (Bol. Soc. Quím. Peru, 1937, 3, 3—14).—A review.

F. R. G.

Geometrical model of the atomic nucleus. W. WEFELMEIER (Naturwiss., 1937, 25, 525).—Theoretical. Possible geometrical arrangements of α -particles in the nuclei of various atoms are proposed and discussed.

A. J. M.

Energy of nuclear reactions. E. GRASSMANN (Physikal. Z., 1937, 38, 674—675).—The relationship stated by Wilson (A., 1936, 266) that the energy set free in nuclear processes is an integral multiple of 3.85×10^5 e.v. has been tested with the data collected by Flüge *et al.* (this vol., 59) for 59 nuclear reactions of elements from Li to S. Only 5% of the reactions agree well with the relationship, and 17% give deviations of 0.41—0.5 from integers for the quotient of the energy liberated by 3.85×10^5 . It is concluded that the data do not support the relationship.

A. J. M.

Electrical quadrupole moments of atomic nuclei. U. FANO (Naturwiss., 1937, 25, 602).—Theoretical. The α -particle model of the at. nucleus gives a reasonable explanation of the observed large positive quadrupole moments of nuclei.

A. J. M.

Bremsstrahlung. J. C. JAEGER (Nature, 1937, 140, 108—109).—Theoretical. The method previously used (A., 1936, 400) to calculate the cross-section for pair production by a beam of γ -rays has been extended to transitions of a Dirac electron between two states of positive energy in a Coulomb field.

L. S. T.

Radiation field of the electron. F. BLOCH and A. NORDSIECK (Physical Rev., 1937, [ii], 52, 54—59).—Mathematical. A method of overcoming defective results in the treatment of radiative corrections in non-stationary processes such as the scattering of an electron in an at. field or the emission of a β -ray is developed. The quantum mechanical calculation yields the directly reinterpreted results of the classical formulæ.

N. M. B.

Low-frequency radiation of a scattered electron. A. NORDSIECK (Physical Rev., 1937, [ii], 52, 59—62; cf. preceding abstract).—Mathematical. The radiative scattering of a non-relativistic electron is treated by an approx. method which neglects the reaction of the radiation field on the motion of the electron.

N. M. B.

Polarisation effects and the Dirac electron. G. WANNIER (Arch. Sci. phys. nat., 1937, [v], 19, 111—118).—Mathematical. Perturbation effects are independent of electron spin, and, if exchange effects are neglected, the formation of an electron pair by an electron is independent of the spin of the latter.

N. M. B.

Existence of heavy electrons. E. C. G. STUECKELBERG (Physical Rev., 1937, [ii], 52, 41—42).—Evidence for the existence of charged particles of mass 50 times that of the electron is examined mathematically.

N. M. B.

Mass of the neutrino from the disintegrations of carbon by deuterons. T. W. BONNER, L. A. DELSASSO, W. A. FOWLER, and C. C. LAURITSEN (Physical Rev., 1936, [ii], 49, 203—204).—The disintegration energies found for the reactions $^{12}\text{C} + ^2\text{H} \rightarrow ^{13}\text{C} + ^1\text{H}$, $^{12}\text{C} + ^2\text{H} \rightarrow ^{13}\text{N} + ^1_0\text{n}$, and $^{13}\text{N} \rightarrow ^{13}\text{C} + e^+ + \text{neutrino}$ are 2.65 ± 0.07 , -0.37 ± 0.03 , and 1.45 ± 0.10 , respectively. Using 1.00859 ± 0.00011 as the mass of the neutron and $0 = 16$, this gives 0.00006 ± 0.00017 for the mass of the neutrino.

L. S. T.

Propagation and absorption of the neutrino. B. FERRETTI (Nuovo Cim., 1937, 14, 70—75).—Mathematical.

O. J. W.

Constitution of the photon considered as a dipole. J. MALFITANO (Compt. rend., 1937, 205, 220—222).—The photon is considered as an aggregate of a neutrino, a positron, and a negatron.

A. J. E. W.

Quantisation of the field in the theory of the photon. L. DE BROGLIE (Compt. rend., 1937, 205, 345—349).—Mathematical.

J. W. S.

Electronic charge e and the materialisation of the photon. S. A. DE MAYOLO (Compt. rend., 1937, 205, 360—362).—Mathematical.

J. W. S.

Mathematical expression of charge distribution in a space lattice. V. JOHNSON (Physical Rev., 1936, [ii], 49, 412).

L. S. T.

Method of determining the ranges of charged corpuscles. G. A. ANSLOW (Physical Rev., 1936, [ii], 49, 480).—An equation is given. L. S. T.

Symmetrical theory of the electron and of the positron. E. MAJORANA (Nuovo Cim., 1937, 14, 171—184).—Theoretical. O. J. W.

Study of the matrix. Electric moment. M. COURTINES (Ann. Physique, 1937, [xi], 8, 5—145).—Mathematical. The matrix electric moment is developed, and the results are applied to the Stark effect with strong fields, the theorem of Niessen, and dielectric polarisation. A. J. M.

Magnetic and electric moment of the electron according to Dirac's theory. W. KOFINK (Ann. Physik, 1937, [v], 30, 91—98).—It is shown that the components of the density of the magnetic and electric moments of the electron can be calc. from the components of the density of the current and the mechanical spin-moment. O. D. S.

Physics of the ionosphere. H. R. MIMNO (Rev. Mod. Physics, 1937, 9, 1—43).—A comprehensive survey under the following main headings: historical and experimental basis and elementary theory; forces on, and equations of motion of, the electron; magneto-ionic double refraction; collisional friction; analysis by conformal representation; "fine structure" of the ionosphere; stratification and tidal effects; sunspots, the aurora, magnetic storms, meteors, and barometric effects; scattering and interaction of radio waves, and eclipse observations. N. M. B.

Specific oscillation of a Fermi gas and application of Bloch's retardation formula for fast particles. H. JENSEN (Z. Physik, 1937, 106, 620—632).—Theoretical. A. E. M.

Characteristic symbols in light absorption. A. THIEL (Z. Elektrochem., 1937, 43, 696—697).—Suggestions are made for standard nomenclature and symbols. J. W. S.

Sharp absorption lines for use as a comparison spectra in stellar photography. F. H. SPEDDING (Physical Rev., 1937, [ii], 52, 137—138).—The absorption spectra of solid $\text{Eu}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ and of Eu_2O_3 suspended and dissolved in B_2O_3 glass were photographed and gave sharp lines even at room temp. The simple well-placed multiplets 4600, 5200, and 5700 Å. are well suited for measuring Doppler shifts of other lines, and are theoretically preferable to those of Nd. N. M. B.

Ultra-violet emission spectrum of the slow thermal dissociation of silver azide. R. AUDUBERT (Compt. rend., 1937, 205, 133—135; cf. this vol., 164, 370).—The spectrum obtained with a quartz prism monochromator was explored with a CuI photon counter in the λ range 1950—2600 Å. Narrow bands at approx. 2150, 2300, and 2400 Å. were observed. These $\lambda\lambda$ correspond with possible electronic transitions of N_2 . A. J. E. W.

Radical OH in hydrogen flames at low pressures. V. KONDRATEEV and M. ZISKIN (Acta Physicochim. U.R.S.S., 1937, 6, 307—319).—From absorption spectra the presence of OH radicals, at a

concn. approx. 1000 times the equilibrium concn., has been established in the combustion zone of H_2 burning in O_2 at 470—550° and at 3—25 mm. Hg. The absorption coeffs. of the individual rotation lines lead to calc. vals. for the temp. of the flames approx. equal to vals. obtained with a thermocouple. An important role in the combustion mechanism of H_2 is ascribed to the OH radicals. C. R. H.

Band spectrum of chromium hydride, CrH . A. G. GAYDON and R. W. B. PEARSE (Nature, 1937, 140, 110).—A band observed in the region 3600—3700 Å. when a high-tension arc is run between Cr electrodes in a flame of H. burning in air is attributed to CrH . L. S. T.

Molecular spectra of zinc hydride and deuteride. Y. FUJIOKA and Y. TANAKA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 143—156).—The $^2\Pi \rightarrow ^2\Sigma$ bands of ZnH and ZnD in the violet have been photographed. Twelve branches of $0 \rightarrow 0$ bands are analysed and the consts. of the $^2\Sigma$ and $^2\Pi$ states are calc. for both spectra. A. J. M.

Fine structure of the 5998.9 band of nitric oxide. C. JAUSERAN, L. GRILLET, and M. DUFIEUX (Compt. rend., 1937, 205, 39—41).—The structure of the band has been examined with improved apparatus. The fine structure precludes any connexion with the known 2Σ states for the neutral NO mol., but the existence of triplets suggests that the band is due to the ionised NO mol. C. R. H.

Absorption spectrum of bivalent samarium. F. D. S. BUTEMENT and H. TERREY (J.C.S., 1937, 1112—1113).—The absorption spectrum of aq. SmCl_2 consists of bands with max. at 5593 and 4731 Å., and a region of overlapping bands extending from about 4500 Å. into the ultra-violet. The spectrum, which fades rapidly owing to the reaction $3\text{SmCl}_2 + 3\text{H}_2\text{O} \rightarrow 2\text{SmCl}_3 + \text{Sm}(\text{OH})_3 + 3\text{H}$, resembles that of Eu^{++} as was anticipated theoretically, but the bands are broader than is usual for rare earths. J. G. A. G.

Absorption spectra evidence of the decomposition of the ground term of Nd^{+++} ion due to crystalline fields. (A) D. M. BOSE. (B) W. G. PENNY and G. J. KYNCH (Nature, 1937, 140, 109, 109—110).—(A) Results obtained [P. C. MUKHERJI] on the absorption spectra of crystals of $\text{NdCl}_3 \cdot 6\text{H}_2\text{O}$ are discussed. They agree with the predictions of Penney and Schlapp's theory (A., 1932, 985), and appear to afford an optical verification of the splitting up of a term in a cryst. field as calc. from purely magnetic data.

(B) Spedding's conclusions (this vol., 216) are critically discussed. L. S. T.

Structure of the bands in the fluorescence spectrum of the aqueous solutions of terbium salts. N. KREMENEVSKI, J. LARIONOV, and A. SEIDEL (Acta Physicochim. U.R.S.S., 1937, 6, 481—486; cf. A., 1936, 778).—The fluorescence spectrum of aq. TbBr_3 is much weaker than that of aq. $\text{Tb}_2(\text{SO}_4)_3$, $\text{Tb}_2(\text{SeO}_4)_3$, or TbCl_3 , and decreases rapidly with rising temp., disappearing at 75°. This is due to absorption by Br^- , since the fluorescence is also destroyed by interposing in the light beam aq. KBr or HBr at $>70^\circ$. The long- λ limit of continuous absorption of

0.05% aq. KBr is displaced from 2150 Å. at 0° to 2265 Å. at 97–99° (cf. A., 1929, 1363). The fluorescence bands of Tb⁺⁺⁺ salts all show separate sharp max. at 6210, 5890, and 5440 Å., which coincide for all salts. TbCl₃ and TbBr₃ also show a third max. in the yellow band, attributable to the presence of a complex. It is inferred that surrounding ions produce an influence on the excited ions.

J. W. S.

Third absorption bands of co-ordination compounds. IV. [Co dg₂' pyCl], [Co(NH₃)₂(NO₂)₂ox]NH₄·H₂O, and [Co ox₃]K₃·3.5H₂O. S. KASHIMOTO and M. KOBAYASHI (Bull. Chem. Soc. Japan, 1937, 12, 350–352; cf. this vol., 216).—Extinction coeffs. of aq. solutions of [Co dg₂'·C₂H₅N₂Cl], [Co(NH₃)₂(NO₂)₂C₂O₄]NH₄·H₂O, and [Co(C₂O₄)₃]K₃·3.5H₂O (dg' = dimethylglyoxime radical) have been determined. In each case a third absorption band was found at $\nu = 120 \times 10^{13}$, showing that a chelate bivalent radical, e.g., C₂O₄, can also give rise to the third absorption band when coupled with a negative radical co-ordinated in the *trans* position.

J. G. A. G.

Scheme of dissociation of the CN molecule. R. SCHMID, L. GERÖ, and J. ZEMPLÉN (Naturwiss., 1937, 25, 558).—A method for obtaining the dissociation scheme for CN is outlined.

A. J. M.

Ultra-violet absorption spectrum of carbon disulphide vapour. J. F. NIELSEN, F. W. CRAWFORD, and L. D. HUFF (Physical Rev., 1936, [ii], 49, 413).—Many bands between 2300 and 1900 Å. have been measured and those between 3800 and 2900 Å. re-measured. The variation of the intensities with temp. has been studied for both band systems by Clements' method.

L. S. T.

Fluorescence of acetone vapour. R. PADMANABHAN (Proc. Indian Acad. Sci., 1937, 5, A, 594).—Bands previously reported as structureless (A., 1934, 1184) consist of diffuse bands superposed on a continuous spectrum; approx. $\lambda\lambda$ of these bands are given. A similar fine structure was observed with COMeEt.

A. J. E. W.

Ultra-violet absorption spectrum of benzene. G. B. KISTIAKOWSKY and A. K. SOLOMON (J. Chem. Physics, 1937, 5, 609–616).—The ultra-violet absorption spectra of C₆H₆ and C₆D₆ have been examined at temp. between –15° and 220°. Two fundamental frequencies of the normal state are deduced from the Boltzmann distribution function. One of these is the Raman frequency 404 cm.⁻¹ and the other is approx. 605 cm.⁻¹ The significance of these frequencies in interpreting the spectrum of C₆H₆ is discussed.

W. R. A.

Influence of substituents on the ultra-violet absorption of benzene chromophores conjugated with other chromophores. M. PESTEMER (Z. Elektrochem., 1937, 43, 691).—Cf. A., 1936, 1318; this vol., 280.

J. W. S.

Absorption spectra of pyrrole and its derivatives. IX. Absorption spectra of acetyl derivatives. G. V. KORSCHUN and K. V. ROLL (Trav. Inst. Chim. Charkov, 1935, 1, 9–18).—Introduction of Ac groups into 2:4-dimethylpyrrole causes a shift of the absorption curves towards the red end of the

spectrum, and of max. absorption in the direction of thinner layers. The effect is more marked with 3- than with 5-Ac derivatives, and is not significantly intensified by introducing a second Ac, but is weakened in presence of CO₂Et at 3 or 5. The curves in EtOH and EtOH–NaOH are practically identical. R. T.

Reversible polymerisation as a cause of new types of absorption bands. III. G. SCHEIBE, A. MAREIS, and H. ECKER (Naturwiss., 1937, 25, 474–475; cf. this vol., 165).—Previous work on the absorption spectra of aq. solutions of pinacyanol chloride (I) is reviewed and extended. The distribution of (I) between C₅H₁₁·OH–C₆H₆ mixtures and H₂O shows that for higher concns. (I) has the same mean mol. wt. in both solvents. In C₅H₁₁·OH–C₆H₆ there is no great change in the absorption spectrum over the concn. range 6.8×10^{-7} – 8.7×10^{-5} , contrary to the behaviour in H₂O, although polymerisation occurs. Hence there are optically "active" and "inactive" types of polymerisation. If a quinoline group in ψ -isocyanine chloride is replaced by the benzthiazole or benzselenazole group, the dyes produced have, at higher concns. a new, wider absorption band, and show gelatinisation. If ψ -isocyanine chloride is mixed with one of these dyes, there is not simple superposition of the absorption spectra, but a new band is produced, depending in position and width on the proportions of the substances mixed. H₂O is necessary for the production of the band.

A. J. M.

Absorption spectra of compounds related to sterols. T. R. HOGNESS, A. E. SIDWELL, jun., and F. P. ZSCHEILE, jun. (J. Biol. Chem., 1937, 120, 239–256).—Absorption spectra of the following have been determined in EtOH: phenanthrene, phenanthraquinone, 7-dehydrocholesterol, theelin, androsterone, Δ^4 -androsterone-3:17-dione, cholestenone, cortical compound E (A., 1936, 1117), ergosterol, and *p*-cresol. The last four compounds were examined also in isooctane. There is strong similarity between the curves for theelin, oestradiol, theelol, and *p*-cresol. *p*-Cresol was isolated from several urine concentrates. Compound E probably contains an $\alpha\beta$ unsaturated ketone grouping.

J. N. A.

Absorption spectroscopy in the ultra-violet. I. Absorption spectra of proteins, carbohydrates, and fats, including their constituents and decomposition products. F. ELLINGER (Separate, Den Haag, 1937, 53 pp.).—Absorption spectra of 188 compounds are graphically represented. C. R. H.

Absorption spectra of visual purple and of indicator-yellow.—See A., III, 340.

Raster type of reflexion grating. K. H. HELLWEGE (Z. Physik, 1937, 106, 588–596).—Formulae are developed which can be applied to a reflexion grating with grooves of rectangular cross-section. An example shows that such a grating with grooves of suitable depth and spacing can be used in the far infra-red, since at 35 μ it is four times as effective as a wire grating with similar consts.

A. E. M.

Spectrum and molecular structure of carbon suboxide, and evidence for hybrid links. H. W. THOMPSON and J. W. LINNETT (J.C.S., 1937, 1291–1295).—Vals. of the force consts. of the linkings

in the C_3O_2 mol. calc. from the vibration frequencies (this vol., 62, 110) lie between those of double and triple linkings (cf. A., 1933, 1222). J. G. A. G.

Infra-red absorption spectrum of carbon suboxide. R. C. LORD, jun., and N. WRIGHT (J. Chem. Physics, 1937, 5, 642—649).—The infra-red spectrum of C_3O_2 has been examined between 2 and 25 μ . The non-appearance of Raman-active fundamental frequencies in the absorption curve supports the view that C_3O_2 has a centre of symmetry. On this basis the allowed binary and ternary combination tones are discussed, particularly those affecting the two infra-red-active degenerate frequencies. One of these is approx. 200 cm^{-1} and outside the range of experimental determination; the other cannot be fixed with certainty, but is most probably 550 cm^{-1} . An interpretation of observed bands is given.

W. R. A.

Spectroscopic studies of the hydrogen bond.
I. A photometric investigation of the association equilibrium in the vapour of acetic acid. R. M. BADGER and S. H. BAUER (J. Chem. Physics, 1937, 5, 605—608).—By photometric measurement of the narrow OH band at 9750 Å. the association equilibrium of AcOH vapour has been studied. This band is characteristic of single mols. The agreement between the results and those of v.p. measurements is good. This indicates that association is predominantly due to H bond formation and that two H bonds are formed. In the vapour state an OH band characteristic of double mols. could not be detected under the experimental conditions, but in the liquid state and in CCl_4 solution an OH band at 10,100 Å. was observed. The spectroscopic criterion of the presence of H bonds should be the shift and modification of the OH band rather than its disappearance.

W. R. A.

Complexity of absorption bands in the infra-red for OH. P. BARCHEVITZ and R. FREYMAN (Compt. rend., 1937, 204, 1729—1732; cf. this vol., 344).—The 3600 cm^{-1} band of org. compounds is shown to be split into two under the influence of α -Cl, -Br, -I, and of C:C, or CO in an added mol. (e.g., $BuOH + COMe_2$), due probably to the effect on the free rotation of the OH. The displacement of the band is related to the electrical moment of the substituent.

R. S. B.

Near infra-red absorption band of liquid water at 1.79 μ . J. R. COLLINS (Physical Rev., 1937, [ii], 52, 88—90; cf. Ellis, A., 1931, 1211).—The existence of the band is confirmed. No apparent changes in the band were detected in the temp. range 4—137°.

N. M. B.

Infra-red absorption spectra of liquid and solid water and water in solution. G. BOSSCHIETER and J. ERRERA (Compt. rend., 1937, 204, 1719—1721).—The absorption spectrum of approx. 0.01% H_2O in CS_2 shows a band at 3640 cm^{-1} , which becomes 3550 and 3720 cm^{-1} in CCl_4 , corresponding with the valency vibrations of a single mol. The doubling in CCl_4 is due to rotation, which is favoured by the approx. spherical mols. of CCl_4 . In liquid and solid H_2O bands occur owing to H links in which each O

is surrounded by 4 H (cf. Bernal and Fowler, A., 1934, 13).

R. S. B.

Intramolecular linkings of water studied in the infra-red at 3 μ . G. BOSSCHIETER and J. ERRERA (J. Phys. Radium, 1937, [vii], 8, 229—232; cf. A., 1935, 564).—By determining the spectrum of H_2O near 3 μ in different states, at different temp., and at various concns. in different solvents two bands can be distinguished. One (3500—3700 cm^{-1}) is due to single mols. and alters in position according to the nature of the solvent; the other at about 3300 cm^{-1} is multimol. in origin and due to H bonds.

W. R. A.

Far infra-red spectrum of water vapour. H. M. RANDALL, D. M. DENNISON, N. GINSBURG, and L. R. WEBER (Physical Rev., 1937, [ii], 52, 160—174).—Full data, measured at high dispersion, for 18—75 μ are tabulated. Identifications, analyses, and energy levels of the mol. up to and including the group of $J = 11$ accurate to 0.1 cm^{-1} are given and checked by combination relations and the formation of analytic series from analogous lines. All allowed transitions with their intensities are calc. and plotted above the observed spectrum. Improvements in the long-wave spectrometer are described.

N. M. B.

Hindrance of inner rotation in ethane. E. BARTHOLOME and J. KARWEIL (Naturwiss., 1937, 25, 476).—A re-examination of the fundamental frequencies of C_2H_6 in the infra-red and Raman spectra and calculation of the sp. heat gives 420 g.-cal. for the height of the potential barrier which must be exceeded for free inner rotation of the Me groups in C_2H_6 .

A. J. M.

Infra-red spectrum and molecular structure of diketopiperazine and tetramethyldiketopiperazine. L. KELLNER (Nature, 1937, 140, 193).—Absorption bands in the region 2.8—3.6 μ and their assignments to vibrations of mol. groups are recorded. The similarity of the spectra of the two compounds confirms the view that in the cryst. state diketopiperazine occurs in the keto-form free from admixture with the enol form. The possibility that a certain amount of each substance exists in the lactim form is not excluded.

L. S. T.

Infra-red absorption of cyanides, thiocyanates, and their isomerides. D. WILLIAMS (Physical Rev., 1936, [ii], 49, 197).—Several org. cyanides and aq. solutions of inorg. cyanides show a characteristic band in the region 4.38—4.90 μ . This absorption is attributed to changes in the vibrational energy of the bound CN group. In org. cyanides and thiocyanates and their isomerides bands characteristic of NC are of greater intensity and appear at longer λ than the corresponding CN bands.

L. S. T.

Infra-red absorption spectrum of vitamin-C. D. WILLIAMS and L. H. ROGERS (J. Amer. Chem. Soc., 1937, 59, 1422—1423).—Investigation of the region 2—8 μ in aq. solution has revealed the existence of the 6 absorption bands which are to be expected from considerations of the mol. structure, and 2 other bands which may arise from the lactone linking.

E. S. H.

Raman effect and molecular structure. C. S. VENKATESWARAN (Current Sci., 1937, 6, 5—12).—A review.

Chemical application of the Raman effect. J. H. HIBBEN (J. Washington Acad. Sci., 1937, 27, 269—299).—Presidential address. An outline of the interpretation, development, and application of Raman spectra, and an analysis of the data on which such interpretations and applications are predicted. N. M. B.

Degree of depolarisation of light scattered under different conditions. R. GANS (Physikal. Z., 1937, 38, 625—626).—The Krishnan equation for degree of depolarisation of scattered light is considered inaccurate. The observations of Krishnan agreed with his equation but it is pointed out that the error involved in such determinations is considerable. A. J. M.

Low and high Raman frequencies for water. I. R. RAO and P. KOTESWARAN (J. Chem. Physics, 1937, 5, 677).—Various Raman lines recorded by Magat (A., 1936, 1179) and Hibben (this vol., 218) as excited by 2537 Å. Hg line are actually the 3200—3600 cm^{-1} band excited by other Hg lines. A line 1659 cm^{-1} previously reported as doubtful is now shown to be genuine. W. R. A.

Scattering of light by water. L. H. DAWSON and E. O. HULBURT (J. Opt. Soc. Amer., 1937, 27, 199—201).—Using a quartz spectrograph and recording densitometer, measurements of the relative intensities of light scattered by pure H_2O for the range 5790—2536 Å. were made. The scattering coeff. increased with decreasing λ in fair agreement with the $\lambda^{-4} f(u)$ expression of the density fluctuation theory. N. M. B.

O-H Raman frequency in inorganic acids. C. S. VENKATESWARAN (Nature, 1937, 140, 151).—Raman frequencies, near 3000 Å., of the OH band are recorded for 100% H_2SO_4 , and crystals of HIO_3 , H_2SeO_3 , H_6TeO_6 , and H_3BO_3 . In these acids the OH frequency is represented by a weak, broad, and diffuse band, at a val. < that in KOH or in MeOH and EtOH. There is a progressive fall in the characteristic frequency shift and a diminished intensity of the band with an increase in strength of the acid. In the case of H_2SO_4 , the band appears to be resolved into two components. The existence of the O-H linking in acids, although considerably weakened as compared with alkalis, must now be postulated. L. S. T.

Raman spectrum of deuterium peroxide. F. FEUER (Z. Elektrochem., 1937, 43, 663—664).— D_2O_2 can be prepared by the action of D_2O vapour on D_2SO_4 and $\text{K}_2\text{S}_2\text{O}_8$ at 70° and fractionated to 99.7% concn. The exchange reaction between D_2O_2 and H_2O_2 is very rapid, and an equimol. mixture yields 48 mol.-% of HDO_2 . The Raman spectra of H_2O_2 and D_2O_2 both show a frequency of 877 cm^{-1} , attributable to the valency vibration between the O atoms. The frequencies 3395 and 1421 cm^{-1} in H_2O_2 change to 2510 and 1009 cm^{-1} , respectively, in D_2O_2 . This reduction of $1/\sqrt{2}$ is in accord with theory. HDO_2 shows a combination of the D_2O_2 and H_2O_2 spectra. J. W. S.

Molecular vibrations and Raman spectrum of deuterium compounds. O. REDLICH (Z. Elektrochem., 1937, 43, 661).—Recent work of the author and his co-workers is summarised. J. W. S.

Raman spectra of gaseous, liquid, and solid hydrogen sulphide. G. M. MURPHY and J. E. VANCE (J. Chem. Physics, 1937, 5, 667).—Employing as exciting radiation a helical Pyrex arc, H_2S gas at 2 atm. gives only one Raman line at 2615 cm^{-1} in agreement with previous observations. Liquid H_2S at -80° shows a single frequency of 2577 cm^{-1} as previously recorded. Only two lines (not four as reported by Sirkar and Gupta; A., 1936, 922) at 2550 and 2523 cm^{-1} could be detected for solid H_2S . Gaseous D_2S gives one frequency at 1885 cm^{-1} in tolerable agreement with infra-red data. W. R. A.

Raman effect with aqueous solutions of alkali chlorides. F. CENNAMO (Nuovo Cim., 1937, 14, 64—69).—The frequencies and intensities of the Raman bands in aq. solutions of the chlorides of Li, Na, K, Rb, and Ca have been measured. The bands are only slightly different from those of H_2O . In NaOH the bands are considerably modified. O. J. W.

Raman effect and dipole moment in relation to free rotation. IX. Rotation around the S-S bond. Y. MORINO and S. MIZUSHIMA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 220—227).—The Raman spectrum of S_2Cl_2 has been examined. There is no difference in intensity between the Raman spectrum of S_2Cl_2 and its solution in C_6H_{14} , which suggests that, if the constitutional formula is Cl-S-S-Cl , there is no oscillatory rotation about the *trans*-position, such as has been observed with $(\text{CH}_2\text{Cl})_2$. Considerations of dipole moment do not allow the rigid *trans*-structure, and electrostatic interaction prevents completely free rotation. There must be a stable configuration other than the *trans*-structure, and for this it is necessary to assume the existence of an intramol. force more powerful than the electrostatic or steric repulsion. This force can be produced by interaction of the electronic clouds of the S atoms. The normal modes of vibration of such a mol. with an azimuthal angle of 90° are considered, and the force consts. are calc. A. J. M.

Raman spectra of the two molecular forms of phosphorus pentachloride. H. MOUREU, M. MAGAT, and G. WETROFF (Compt. rend., 1937, 205, 276—278).—The Raman spectra of liquid and solid PCl_5 are different, and at the m.p. the two spectra are superposed. In the liquid PCl_5 has the trigonal bipyramidal structure; in the solid it is $(\text{PCl}_4)_2\text{Cl}$ in which four Cl are arranged tetrahedrally, the fifth being more loosely (perhaps electrovalently) bound. F. J. G.

Raman spectrum of anhydrous perchloric acid. A. SIMON and H. REUTHER (Naturwiss., 1937, 25, 477).—The Raman spectrum of 99.8% HClO_4 consists of 5 lines and 2 bands. The HClO_4 mol. is pyramidal with the Cl at the centre of gravity; the 3 O at the base, and an OH at the apex. The pyramid has an axis of three-fold symmetry and a plane of symmetry. HClO_4 is a pseudo-acid changing into the *ac*-form on dilution. A. J. M.

Raman spectra of low frequencies and intermolecular forces. E. GROSS and E. KOMAROV (Acta Physicochim. U.R.S.S., 1937, 6, 637—638; cf. A., 1936, 547; this vol., 283).—The Raman spectrum of CS_2 at about 0.5 atm. shows no trace of the strong 70 cm^{-1} frequency observed in the solid, although the less intense 655 cm^{-1} line is distinct. This is interpreted as proving that the low-frequency Raman spectrum is due to intermol. forces. J. W. S.

Raman effect. LXXI. cycloPropanecarboxylic and acrylic acids and derivatives. K. W. F. KOHLRAUSCH and R. SKRABAL (Monatsh., 1937, 70, 377—397; cf. this vol., 220).—Data are recorded for cyclopropanecarboxylic acid and acrylic acid and their Me, Et, Pr^a, Pr^b, and Bu^v esters and chlorides, for the Bu^v esters of AcOH and Pr^aCO₂H, and for the Pr^a, Pr^b, and Bu^v esters of Pr^bCO₂H. Constitutive influences in these spectra are discussed. H. J. E.

Raman effect. LXXII. Nitrogen compounds. IV. Nitriles. A. W. REITZ and R. SKRABAL (Monatsh., 1937, 70, 398—404).—Data are recorded for cyanocyclo-propane, -butane, and -pentane, and for aceto-, propio-, isobutyro-, acrylo-, and *n*- and *iso*-valero-nitrile. The variation of the C=N frequency is discussed. H. J. E.

Raman spectrum of some ketones. Influence of cyclisation. (MLLE.) D. Biquard (Compt. rend., 1937, 204, 1721—1723).—The Raman spectra of COMePr, COEt₂, cyclopentanone, COMeBu, COEtPr, cyclohexanone, COMe·C₆H₁₁, COEtBu, COPr₂, suberone, COPhEt, indanone, COPhPr, tetralone, COPhBu, and benzosuberone have been determined. The frequency ~ 1680 to 1700 cm^{-1} corresponding with CO increases on passing from a chain to a compound with a 5-membered ring, but decreases when the ring contains 6 or 7 atoms. The frequency decreases with cyclic compounds on increasing the no. of atoms in the ring from 5 to 7. R. S. B.

Raman effect. LXXIII. Derivatives of the three- and four-ring. R. SKRABAL (Monatsh., 1937, 70, 420—424).—Raman spectrum data are recorded for Et₂ cyclopropane- and cyclobutane-1:1-dicarboxylate, Me cyclopropyl- and cyclobutyl-carbamate, aminocyclobutane and its *N*-Me₂ derivative and diazotisation products. From the Raman spectrum, the diazotised product contains approx. equal proportions of cyclopropylcarbinol and cyclobutanol. H. J. E.

Raman frequencies of dioxan. R. C. WILLIAMSON (J. Chem. Physics, 1937, 5, 666).—Raman displacements are recorded. W. R. A.

Raman spectra of oxonium compounds. G. BRIEGLEB and W. LAURPE (Nature, 1937, 140, 236—237).—Frequencies are recorded for the following systems, at temp. from -80° to -32° , with the H halide in excess: MeOH-HCl (or HBr), EtOH-HCl (or HBr), Me₂O-HCl (or HBr), and Et₂O-HCl (or HBr). The spectra of these solutions are characteristically different from those of the components, and show that the compounds do not exist in solution of excess of H halide as oxonium compounds, but as compounds, named "oxan," with O^{IV}. L. S. T.

Intensity of the Raman continuum in alcohol-benzene mixtures. A. CARRELLI and F. CENNAMO (Nuovo Cim., 1937, 14, 217—221).—The Raman continuous spectrum obtained with EtOH-C₆H₆ mixtures in the neighbourhood of the 4046 Å. exciting line is abnormal, due to the vibration frequencies of intermol. bonds. O. J. W.

Scattered radiation of mixed crystals. M. VUKS (Acta Physicochim. U.R.S.S., 1937, 6, 327—338).—Mixed crystals of *p*-C₆H₄Br₂ and *p*-C₆H₄Cl₂ were examined over a range of concns. For large frequencies the spectrum of each component is superposed on the other, but for smaller frequencies there is gradual transition from one component to the other. The crystals of *p*-C₆H₄Br₂ are isomorphous with the α -modification of *p*-C₆H₄Cl₂. It is impossible to obtain mixed crystals with the β -modification of *p*-C₆H₄Cl₂ if the concn. of *p*-C₆H₄Br₂ is $> 1\%$. C. R. S.

Polarisation of Raman lines of some organic compounds. B. K. CHAUDHURI (Indian J. Physics, 1937, 11, 203—211).—The depolarisation factors for lines in the Raman spectra of piperidine (I), (CH₂NH₂)₂, NHET₂, and NET₃ have been determined. (I) has puckered ring structure; in (CH₂NH₂)₂ there is no free rotation about the C-C axis, but the NH₂ rotate about the C-N bonds. F. J. L.

Physical identity of enantiomerides. IV. Raman spectra of *d*- and *l*-camphoric acids and -camphoric anhydrides. B. K. SINGH and B. MISRA (Proc. Indian Acad. Sci., 1937, 6, A, 90—96).—Raman spectra of the *d*- and *l*-forms are identical. An intense line at 706 cm^{-1} in the acid, due to the C(C)₄ group, is shifted to 607 cm^{-1} in the anhydride. C. R. H.

Inhibition of fluorescence. K. S. G. DOSS (Proc. Indian Acad. Sci., 1937, 6, A, 24—31).—The efficiency of various ions as inhibitors of the fluorescence of solutions of quinine sulphate and Na fluoresceinate, and the efficiency of quinine sulphate and "aniline-iodoeosin" as auto-inhibitors of fluorescence, have been calc. from recorded data. Whilst inhibition by ions such as Cl⁻, Br⁻, etc. can be interpreted on the basis of collisions of the second kind, the high efficiency of auto-inhibition can be explained only by assuming polymerisation of the fluorescent substances. C. R. H.

Band analysis of the scintillation spectra of zinc sulphide phosphors excited by α -rays. W. KUTZNER (Z. Physik, 1937, 106, 551—571).—Phosphors were prepared consisting of 5 g. of ZnS + 0.0005 g. of Cu (or other metal) + 0.5 g. of alkali halide. Details of spectra from 22 such preps. are recorded. The no. of bands from each varied from 2 to 6 and fell in the range 4250—6350 Å. A. E. M.

Contact potentials for metals immersed in a dielectric and conduction of electricity by liquid dielectrics. H. J. PLUMLEY (Physical Rev., 1937, [ii], 52, 140; cf. Baker, this vol., 437; Reiss, *ibid.*, 337).—The problem of the origin of the electrical conductivity of pure non-polar dielectric liquids involves the explanation of the field-independent current and of the current at higher field strengths.

Experiments on the contact potential between Au and brass electrodes in isooctane are described which are entirely inconsistent with the Edler-Zeier and Baker-Boltz thermionic emission theory of high field current phenomena. N. M. B.

Photovoltaic effect with a highly insulating substance. G. NADJAKOV (Z. physikal. Chem., 1937, B, 36, 314—321).—When the composition of the light incident on a S-H₂O interface is changed by a filter, a p.d. is established, electrons moving in a direction opposite to that of the incident light. The effect occurs within the S, not merely at the surface. The migration of charge in S seems to be facilitated by light. R. C.

External and internal photo-electric effects of non-conductors. G. NADJAKOV (Z. physikal. Chem., 1937, B, 36, 309—313).—An improvement in the classical method of observing the Hallwachs-Lenard effect is to coat the auxiliary electrode with paraffin, which eliminates its external photo-electric effect. Under these conditions only non-conductors having a photo-electric conductivity exhibit an apparent inverse effect. With Al, brass, shellac, resin, paraffin oil, and glycerol, the external photo-electric effect is entirely unipolar. For S it is unipolar only for $\lambda < 265 \text{ m}\mu$. R. C.

Effect of light on thin metallic layers. Q. MAJORANA (Physikal. Z., 1937, 38, 663—667; cf. A., 1933, 114, 555).—The production of a pulsating electric current in thin foils intermittently illuminated has been further studied with Au foils, and Au films deposited by cathodic sputtering. There is qual. agreement with results calc. on the basis of heat theory, although this is insufficient to explain the smaller phase displacement with thicker foils, and the change in phase displacement with thin foils when different light sources are used. A. J. M.

Photo-conducting effect in thin metallic films. T. FUKUROI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 187—195).—The increase in electrical conductivity on exposure to ultra-violet light of films of Hg, Cd, and Zn deposited on cold (—180°) glass or quartz plates is max. for a definite thickness of film characteristic of each metal. The threshold λ is the same as that of the external photo-electric effect. It is suggested that the film is composed of isolated metallic granules, and that when exposed to ultra-violet light photo-electrons are emitted and move along the surface of the glass or quartz foundation under the potential gradient. A. J. M.

Nature of the barrier layer in the cuprous oxide photo-voltaic cell. II. J. W. BALLARD and E. HUTCHISSON (Physical Rev., 1936, [ii], 49, 411).—Sensitisation of the Cu₂O surface occurs on bombardment with positive ions, negative ions, or electrons; it has not been obtained by heating the disc as a whole. Positions of max. spectral responses and of limiting λ in the near infra-red are independent of the kind of gas used in bombardment. Electrical resistance and total response of a cell depend on the kind of gas, and the former apparently increases with time of bombardment. Max. sensitisation depends on an optimum time, but the position of

max. spectral response is independent of the time of bombardment and probably of the kind of metallic film. L. S. T.

Carrier mobility spectra of spray electrified liquids. S. CHAPMAN (Physical Rev., 1937, [ii], 52, 184—190).—The mobility spectrum of distilled H₂O, and solutions of NaI, LiCl, KCl, AlCl₃, and MgSO₄ electrified by spraying and bubbling was investigated by means of an Erikson mobility apparatus under high resolving power. Current-mobility curves are given, and peaks and the variation of electrification with concn. are interpreted and discussed. The effects on the curves of age of the carriers and humidity of the air were examined. Results indicate that the peaks represent stable groupings and that all the carriers are singly charged. N. M. B.

Mechanism of current conduction in liquids of low dielectric constant. K. H. REISS (Ann. Physik, 1937, [v], 30, 34; cf. this vol., 169).—A correction. The application of Onsager's theory contains a calculation error. O. D. S.

Experiment about electric absorption. C. J. GORTER and F. BRONS (Physica, 1937, 4, 667—668).—A const. electric field up to 5×10^4 volts per cm. had no effect on dielectric losses in dil. solutions of different polar substances in C₆H₆ and PhNO₂. H. J. E.

Dipole loss and molecular structure. E. KEUTNER and G. POTAPENKO (Physikal. Z., 1937, 38, 635—636).—Dispersion and absorption determinations with MeOH, EtOH, PrⁿOH, and BuⁿOH at λ 130—18 cm. have been carried out. The relaxation times from absorption experiments are $<$ those from dispersion, the ratio of the times being equal to the association factor of Debye and Ramm. The calc. mol. radii of the alcohols agree with those obtained from stereochemical data. The rotation of the OH group independently of the rest of the mol. is solely responsible for the dipole loss and dispersion in the above λ range. A. J. M.

Dipole moment and structure of dimethyl-telluronium di-iodide. (A) H. C. YUAN. (B) C. H. YAO and C. E. SUN (J. Chinese Chem. Soc., 1937, 5, 219—222; cf. this vol., 169).—Polemical. R. C.

Possible explanation of some anomalous dipole moments. F. C. FRANK and L. E. SUTTON (Trans. Faraday Soc., 1937, 33, 1307—1316).—It is suggested that the apparent electric moment of non-polar mols. containing balanced polar groups may be due to a combination of local dipole fields and the field applied for measurement in producing local changes in solvent density. This effect will depend on the nature of the solvent and on the moments and no. of polar groups in the solute. The abs. val. for the polarisation of *p*-benzoquinone calc. from the theory is in accord with experiment. The theory is compared with that of Jenkins (A., 1936, 924, 1183) and Bauer (*ibid.*, 1065). J. W. S.

Dielectric properties of acetylenic compounds. VIII. Propiyl chlorides and other acid chlorides. S. M. KOEHL and H. H. WENZKE (J. Amer. Chem. Soc., 1937, 59, 1418—1420; cf. this vol., 347).

—Electric moments of acetyl, propionyl, butyryl, benzoyl, cinnamoyl, butylpropionyl, and amylpropionyl chlorides have been determined. Consideration of the data of dipole moments and chemical reactivity indicates the existence of resonance in these compounds. Three forms are assumed to contribute to the mol. The moments of the acid chlorides attached to unsaturated hydrocarbon residues are $>$ those of the saturated acid chlorides, by reason of resonance of the COCl group with the unsaturated hydrocarbon residue.

E. S. H.

Electric moments of some aliphatic dinitriles. P. TRUNEL (Compt. rend., 1937, 205, 236—238).—Vals. of the moment are given for the dinitriles $\text{CN}[\text{CH}_2]_n\text{CN}$, ranging from 3.55 for $n = 3$ to 4.47 for $n = 10$; they are discussed in relation to the shape of the mols., free rotation of the linkings, and the interaction between the CN groups. The interaction is a max. for $n = 6$. These nitriles exist as single mols. in C_6H_6 solution.

A. J. E. W.

Dipole moment of a monosubstituted derivative of cyclopropane (*n*-propylcyclopropane). J. BOESEKEN and H. V. TAKES (Rec. trav. chim., 1937, 56, 808—862).—*n*-Propylcyclopropane, b.p. 68.5° , has a small dipole moment, 0.75×10^{-18} .

F. L. U.

Moments of coumarin and its 3-phenyl derivative and of substituted γ -pyrones. C. G. LE FÈVRE and R. J. W. LE FÈVRE (J.C.S., 1937, 1088—1090).—The following dipole moments have been determined: coumarin 4.4_D, 3-phenylcoumarin 4.3₀, 2:6-dimethyl- γ -pyrone 4.6₃, 3:5-diacetyl-2:6-dimethyl- γ -pyrone 4.0₆, 2:6-diphenyl-3:5-dimethyl-tetrahydro- γ -pyrone 1.8₀, dehydracetic acid 2.8₃. The bearing of these results on the structures of the mols. is discussed.

J. G. A. G.

Dipole moment of phenyl *p*-tolyl sulphide and covalency angle of sulphur. S. L. CHIEN and T. C. LAY (J. Chinese Chem. Soc., 1937, 5, 204—213; cf. A., 1934, 131).—The dipole moment is 1.75 D. It is calc. that the covalency angle of S in Ph_2S is 115 — 116.5° . Equations for calculating covalency angles of O and S, allowing for interaction moments, have been derived.

R. C.

Electrical saturation in dilute solutions of nitrobenzene. A. PIEKARA (Physikal. Z., 1937, 38, 671—674).—The decrease ($\Delta\epsilon$) in dielectric const. of solutions of PhNO_2 in C_6H_6 , CCl_4 , and C_6H_{14} , respectively, when placed in an electric field (strength E) has been determined. There is an approx. linear relationship between $\Delta\epsilon$ and E^2 . The mutual coupling of PhNO_2 mols. decreases very rapidly with decreasing concn. The coupling between PhNO_2 mols. and mols. of solvent varies considerably for different solvents, being weakest with C_6H_{14} , and strongest with C_6H_6 . The deformation moment of PhNO_2 is due to a displacement of the two O atoms attached to N. In a field of 100 kv. per cm. the O atoms are displaced to the extent of 0.001 Å.

A. J. M.

Molecular rotation in crystalline disubstituted ethanes. A. H. WHITE and S. O. MORGAN (J. Chem. Physics, 1937, 5, 655—665).—Dielectric consts. and conductivities of solid and liquid $(\text{CH}_2\text{Cl})_2$, $(\text{CH}_2\text{Br})_2$, $(\text{CH}_2\text{CN})_2$, $(\text{CH}_2\text{NH}_2)_2$, and $(\text{CH}_2\text{CNS})_2$ over a wide

L. L. (A., I.)

range of temp. have been measured. Thermal measurements show new transitions in $(\text{CH}_2\text{CN})_2$ at -38° to -46° and in $(\text{CH}_2\text{Br})_2$ at -23° to -25° . $(\text{CH}_2\text{CN})_2$ rotates about all three axes of the crystal between transition and m.p. Internal rotational motion in the various mols. is discussed.

W. R. A.

Rotation of some long[-chain] molecules in the solid state. C. P. SMYTH and W. O. BAKER (J. Chem. Physics, 1937, 5, 666).—The dielectric consts. of long-chain mols. in the solid and liquid states have been investigated. Et undecate does not appear to possess general rotational freedom since the dielectric const. drops sharply on solidification and then decreases uniformly and slowly with falling temp. The temp. variations of the dielectric consts. of Et palmitate (α and β), Et stearate, and cetyl alcohol are reported and discussed.

W. R. A.

Refractive indices of liquid oxygen, nitrogen, and hydrogen. H. E. JOHNS and J. O. WILHELM (Canad. J. Res., 1937, 15, A, 101—108).—Vals. of n for λ 6939, 5461, and 4358 Å. have been obtained at temp. ranging from the f.p. to the b.p. The vals. at the b.p. for λ 5461 Å. are O_2 1.2242, N_2 1.1990, H, 1.1120.

C. R. H.

Birefringence of quartz in the far ultra-violet and the Schumann region. R. SERVANT (Compt. rend., 1937, 205, 230—231).—Measurements at $\lambda\lambda$ between 2300 and 1450 Å. are recorded. The birefringence increases rapidly at low $\lambda\lambda$, for which the Coode-Adams formula does not apply.

A. J. E. W.

Optical rotatory power of turbid solutions in an electric field. (A) J. KUNZ and R. G. LABAW. (B) E. B. LUDLAM, A. W. PRYDE, and H. G. RULE (Nature, 1937, 140, 194).—(A) The rotation previously described (A., 1936, 1447) is due to suspended material.

(B) Careful filtration removes the optical activity. The effect is due to dichroism induced in the particles by the electric field.

L. S. T.

Genealogy of phosphorus and its compounds. T. MIŁOBĘDZKI (Rocz. Chem., 1937, 17, 239—253).—A lecture.

R. T.

Structurally equivalent units and the classification of normal and abnormal liquids. R. H. EWELL (J. Amer. Chem. Soc., 1937, 59, 1575—1576).—Liquids are classified as (1) abnormal (compounds which form H linkings, e.g., H_2O , NH_3 , alcohols, org. acids, HF, etc.), (2) intermediate (compounds containing C:O, C:N, or N:O groups, e.g., ketones, esters, nitriles, NO_2 -derivatives, etc.), and (3) normal (all others except molten metals and salts, e.g., hydrocarbons, ethers, SO_2 , PCl_5 , CS_2 , HCl, CO_2 , etc.). Consideration of a no. of aliphatic org. liquids leads to the conclusions that the CH_2 group is structurally equiv. to ether O and the CH group to *tert.* N. The structural equivalence does not appear to hold for aromatic compounds.

E. S. H.

Optical dissociation of polyatomic molecules in vapours. B. VAN MANEN (Chem. Weekblad, 1937, 34, 549—555).—A review.

S. C.

Shape of phase boundaries in liquids. N. F. LASCHKO (Trav. Inst. Chim. Charkov, 1936, 2, 101—

104).—A generalised form of Thomson's formula is derived.

R. T.

Theory of the expanded film. K. ARIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 335—337).—The sudden appearance of the expanded state (cf. A., 1934, 140) is interpreted as the two-dimensional analogue of the sharp transition between the "ferromagnetic" and "paramagnetic" states of an ensemble of mols. with permanent electric moment, μ . The theory is supported by existing data for myristic acid, and leads to the val. $\mu = 2.5 \times 10^{-18}$ e.s.u. J. G. A. G.

Energy exchange between a gas and a solid surface. J. M. JACKSON and H. TYSON (Mem. Manchester Phil. Soc., 1937, 81, 87—102).—Theoretical. The exchange energy between a gas and a solid surface is examined for Ne and W using London's perturbation theory instead of the Born collision theory. The results show that the contribution to the accommodation coeff. from transitions between free states of gas atoms is very small. The energy exchange is mainly carried on by atoms of low kinetic energy by means of transitions between the adsorbed levels and the continuum of free energy states.

A. J. M.

Size of pores and interior volume of amorphous and crystalline substances. G. GRAUE and N. RIEHL (Z. anorg. Chem., 1937, 233, 365—375).—A detailed account of work already noted (this vol., 405).

F. J. G.

Intensity of orbital interaction in crystals. R. FORRER (J. Phys. Radium, 1937, [vii], 8, 241—250).—On the hypothesis of the electronic orbital system the linking which fixes an atom with respect to its neighbours is termed the contact orbital and its intensity $T = F/\sqrt{N}$, where T is temp. of fusion and N is the no. of contacts. A systematic study of F as a function of Z (at. no.) has been made. F depends on a "factor of origin" and the no. of uncoupled spin electrons. "Factors of origin" for elements are identical with factors for ions of singly ionised solid salts and both factors depend only on the principal quantum no.

W. R. A.

Influence of a double linking on the firmness of nearby single linkings. T. FÖRSTER (Z. Elektrochem., 1937, 43, 667—668).—The rule that the presence of a double linking weakens the single linking next but one to it can be deduced from the modern quantum-mechanical theory of valency. J. W. S.

Quantitative discussion of linking orbitals. L. PAULING and J. SHERMAN (J. Amer. Chem. Soc., 1937, 59, 1450—1456).—Theoretical energy curves for one-electron linkings between two atoms are calc. for linking orbitals formed by hybridisation of $2s$ and $2p$ orbitals, $3s$ and $3p$ orbitals, and $3s$, $3p$, and $3d$ orbitals, the same radial part being used for the orbitals in a set. For $s-p$ hybridisation the linking energy is closely proportional to S^2 , with S the magnitude of the angular part of the linking orbital in the linking direction. The energy of a normal covalent linking $A-B$ between unlike atoms is probably represented more closely by the geometric than by the arithmetic mean of the linking energies for $A-A$ and $B-B$. The energy of the one-electron linking in the

Li mol.-ion, calc. by consideration of the $s-p$ separation, is 1.19 e.v. The hybrid linking orbital involves approx. equal contributions from the $2s$ and $2p$ orbitals of the Li atom.

E. S. H.

Carbon-halogen distance in the methyl halides. G. B. B. M. SUTHERLAND (Nature, 1937, 140, 239—240).—The distances between C and halogen atoms in the Me halides now recalcd. from spectroscopic data are < the vals. previously accepted and those obtained by electron diffraction. Comparison with the corresponding distances in the C tetrahalides and of the force consts. for the C-halogen linking in the two cases supports the revised vals.

L. S. T.

Force constants and molecular structure. II. Ethylene. III. Molecules containing C:O and C:C linkings. H. W. THOMPSON and J. W. LINNETT. IV. Ethylene and tetrachloroethylene. J. W. LINNETT and H. W. THOMPSON. V. Relation between force constant and bond length. H. W. THOMPSON and J. W. LINNETT. VI. Compounds containing the cyanide link. J. W. LINNETT and H. W. THOMPSON (J.C.S., 1937, 1376—1384, 1384—1393, 1393—1396, 1396—1399, 1399—1403; cf. this vol., 494).—An investigation of the force consts. of polyat. mols. and their correlation with mol. structure.

II. A potential function for the C_2H_4 mol. is deduced, taking into account both parallel and perpendicular vibrations (cf. Sutherland and Dennison, A., 1935, 569) and force consts. are calc. The form of the vibrations is discussed. The vibration frequencies of C_2D_4 are estimated and differ from those calc. by Manneback and Verleysen (A., 1936, 1324).

III. Potential functions are obtained for C_2H_4 , allene, keten, and CH_2O . Force consts. are deduced and compared with those of C_2H_4 (see above), CO_2 , C_3O_2 , CO , and C_2H_2 (cf. Part I, *loc. cit.*). Vals. for corresponding linkings are, in general, in agreement. Differences can be interpreted as due to the existence of resonance hybrids, C_3O_2 and CO_2 , or to electron drifts in the mol. due to the attraction of the CO group for electrons. The forms of the mol. vibrations are discussed.

IV (cf. this vol., 224). The C-C bond const. in C_2Cl_4 is < in C_2H_4 . It is suggested that the mol. of C_2Cl_4 is a hybrid structure.

V. The relation between force const. and bond length of the C-O, C-C, and C-H linkings in the compounds investigated is in fair agreement with the relationships of Badger (A., 1936, 14) and Clark (this vol., 66).

VI. The force consts. of CN, the CN^- ion, HCN, DCN, C_2N_2 , CNCl, CNBr, CNI, the CNS^- ion, $Hg(CN)_2$, and the $Ag(CN)_2^-$ ion are discussed. The val. of the force const. of the C-N linking in C_2N_2 is < the normal val.; it is suggested that the compound has a mesomeric structure. Similar low vals. are obtained for CNCl, CNBr, and CNI, and for the CNS^- ion, which, it is suggested, may have bonds of $1\frac{1}{2}$ or units. The val. of the C-H bond const. in HCN is high (cf. Part V). The variation of the force const. with bond length is compared with the theories of Badger and Clark (*loc. cit.*).

O. D. S.

Application of a new mathematical method to vibration-rotation interaction. (MISS) J. E. ROSENTHAL and L. MOTZ (Proc. Nat. Acad. Sci., 1937, 23, 259—265). N. M. B.

Vibration-rotation energy levels of polyatomic molecules. III. Effect of centrifugal distortion. E. B. WILSON, jun. (J. Chem. Physics, 1937, 5, 617—620).—Mathematical. An approx. quantum-mechanical treatment is used to calculate the effect of centrifugal distortion on the individual rotational energy levels of semi-rigid asymmetrical rotator mols. Assuming that the vibration functions are harmonic oscillator functions, the numerical coeffs. in this treatment are the same as those obtained by classical treatment. W. R. A.

Elements of the factored secular equation for the semi-rigid water-type rotator, with application to the hydrogen sulphide band at 10,100 Å. B. L. CRAWFORD, jun., and P. C. CROSS (J. Chem. Physics, 1937, 5, 621—625; cf. preceding abstract).—Numerical vals. of the coeffs. of the mol. consts. in the secular equation of Wilson are given and a procedure for obtaining the roots of the equation is described. An application to the H₂S band at 10,100 Å. is made and the vals. are compared with those derived from classical treatment. The new mol. consts. and term vals. of H₂S are given. W. R. A.

Surface tension of heavy water. H. LACHS and I. MINKOW (Rocz. Chem., 1937, 17, 363—366).—No difference is found between the surface tension of H₂O and D₂O, or of its temp. coeff., at 20—27°. Selwood and Frost's results (A., 1933, 1233) are not confirmed. R. T.

Surface tension of some alcohols of the decahydronaphthalene and hydrindane series. W. HUCKEL and F. REIMER (J. pr. Chem., 1937, [ii], 149, 81—84).—Measurements of the surface tension of *trans*-decahydro- α - and - β -naphthol, *cis*-decahydro- β -naphthol, *cis*- and *trans*-5-hydroxyhydrindane, and menthol show that the differences observed are parallel with differences in *d*. In general the differences in surface tension are too insignificant to be useful in the elucidation of constitution. H. W.

Methyleneimines: determination of parachor. D. DICKINSON and J. GRAYMORE (J.C.S., 1937, 1368—1370).—The parachors of methyleneimines prepared by the action of CH₂O on NH₂Me, NH₂Et, NH₂Pr^a, NH₂Pr^b, NH₂Bu^a, and NH₂Bu^b have been measured. Vals. agree with those calc. from Sugden's consts. for the cyclic formula (NR·CH₂)₃, but deviate from those calc. from Mumford and Phillips' standards. The deviation increases on ascending the series and is a max. for the Pr compound. *iso*-Propylmethyleneimine has b.p. 220°. O. D. S.

Focussing of electrons in an X-ray tube. N. C. BEESE (Rev. Sci. Instr., 1937, [ii], 8, 258—262).—A theory to account for the variations in the observed focal spot patterns on the anodes of X-ray tubes caused by changes in the geometry of the cathode structures is postulated. Data on the variation in size and energy distribution within the focal spots with these characteristics are given. N. M. B.

Passage of X-rays through oscillating crystals. R. M. LANGER (Physical Rev., 1936, [ii], 49, 206).—Theoretical. L. S. T.

Lattice sums involved in the calculation of elastic constants. M. G. GOEPPERT-MAYER and A. MAY (Physical Rev., 1937, [ii], 52, 242; cf. A., 1936, 1053).—A correction. N. M. B.

Surface migration of barium. M. BENJAMIN and R. O. JENKINS (Nature, 1937, 140, 152).—No surface migration of Ba either on Ni or W even after 16 hr. at 1100° abs. could be detected. L. S. T.

Structure of electronic excitation levels in insulating crystals. G. H. WANNIER (Physical Rev., 1937, [ii], 52, 191—197; cf. Slater, this vol., 8).—Mathematical. A method of studying the energy spectrum for an excited electron configuration (a single excited electron taken out of a full band of *N* electrons) in an ideal crystal is described. N. M. B.

Modern theory of solids. III. F. SEITZ and R. P. JOHNSON (J. Appl. Physics, 1937, 8, 246—260; cf. this vol., 286).—A survey of the properties of crystal surfaces and of the influence of impurities and flaws on certain vol. characteristics. Contemporary theory is discussed critically and hypotheses are provisionally advanced. N. M. B.

Anisotropic liquids. W. KAST (Physikal. Z., 1937, 38, 627—635).—A review.

Anisotropic growth of silver crystals by condensation from vapour. J. H. HOWEY (Physical Rev., 1936, [ii], 49, 200).—Under certain conditions, Ag vapour condensing in a vac. on suitable nuclei of solid Ag kept at a temp. slightly < the m.p. forms single-crystal needles. Features of this growth are described and an explanation is put forward. L. S. T.

Type of crystalline texture observed in aluminium wire subjected to alternating torsion. R. JACQUESSON (Compt. rend., 1937, 205, 331—332).—Crystals of Al subjected to alternating torsion at first suffer a small dislocation and then break up into an aggregate of crystallites with an oriented structure. R. S. B.

Crystal structure of compounds of the rare earths with the metalloids of the fifth group. II. Nitrides of lanthanum, cerium, and praseodymium. A. IANDELLI and E. BOTTI (Atti R. Accad. Lincei, 1937, [vi], 25, 129—132; cf. this vol., 401).—LaN, CeN, and PrN have a face-centred cubic lattice of the NaCl type, with *a* 5.27, 5.01, 5.15 Å., respectively. The val. of *a* for CeN is abnormally low. The radius of the N^{'''} ion is calc. to be 0.75—0.77 Å. O. J. W.

Constitution of nitrosyl compounds. Crystal structure of nitrosyl perchlorate and nitrosyl borofluoride. L. J. KLINKENBERG (Rec. trav. chim., 1937, 56, 749—754; cf. A., 1936, 275).—X-Ray diagrams of NOClO₄ and NOBF₄ afford evidence of their heteropolar constitution, and show them to be isomorphous with the corresponding NH₄ compounds. Comparison of the diagrams for perchlorates and borofluorides shows that, with respect to size, NO⁺ = H₃O⁺ < NH₄⁺. Dimensions of the

unit cell of NOClO . are : $a\ 9.00 \pm 0.05$, $b\ 5.68 \pm 0.05$, $c\ 7.23 \pm 0.03$ A., mol. vol. 56.0; of NOBF_4 : $a\ 8.79 \pm 0.03$, $b\ 5.66 \pm 0.03$, $c\ 7.10 \pm 0.10$ A., mol. vol. 53.5.

F. L. U.

X-Ray study of potassium hydrogen carbonate. J. DHAR (Indian J. Physics, 1937, 11, 187—191).— KHCO_3 crystals are monoclinic prismatic, $a\ 15.01$, $b\ 5.69$, $c\ 3.68$ A., $\beta\ 104^\circ 30'$, space-group C_{2h} ($P2_1/a$). The CO_3 group has the same shape and dimensions as in NaHCO_3 .

F. J. L.

Salts of hexahydrated cations. I. Hexahydrated hypophosphites of bivalent metals. A. FERRARI and C. COLLA (Gazzetta, 1937, 67, 294—301).—X-Ray measurements show that the compounds $\text{M}(\text{H}_2\text{PO}_2)_2 \cdot 6\text{H}_2\text{O}$ ($\text{M} = \text{Mg}, \text{Ni}, \text{Co}$) have a tetragonal symmetry. In the lattice the $[\text{M}(\text{H}_2\text{O})_6]^{++}$ cations have an octahedral configuration and are arranged with a face-centred, monometric symmetry. The H_2PO_2^- anions have a tetrahedral configuration and are arranged tetragonally; for the compounds in above order $a = 10.29, 10.30, 10.22$ A., respectively. Rose's compound, $2\text{Ca}(\text{H}_2\text{PO}_2)_2 \cdot \text{Co}(\text{H}_2\text{PO}_2)_2 \cdot 2\text{H}_2\text{O}$, does not exist.

O. J. W.

Crystal structure of the ethyl sulphates of the rare earths and yttrium. J. A. A. KETELAAR (Physica, 1937, 4, 619—630).—The dimensions of the elementary cells of the Et sulphates of La, Ce, Pr, Nd, Sa, Gd, Dy, and Yt $[\text{M}(\text{SO}_4\text{Et})_3 \cdot 9\text{H}_2\text{O}]$ were $a\ 14.080, 14.048, 14.007, 13.992, 13.961, 13.931, 13.906, 13.903$ and $c\ 7.11, 7.11, 7.09, 7.07, 7.08, 7.06, 7.04$, and 7.05 A., respectively (symmetry C_{2h}). The intramol. arrangement of the atoms is discussed.

H. J. E.

Crystal and molecular structure of carbon tetraiodide and tetrabromide. C. FINBAK and O. HASSEL (Z. physikal. Chem., 1937, B, 36, 301—308; cf. A., 1925, i, 1).— Cl_4 crystals at room temp. are probably monoclinic and isomorphous with those of CBr_4 , but near the m.p. become isotropic. The unit cell of CBr_4 has $a\ 21.12$, $b\ 12.26$, $c\ 24.14$ A. Electron diffraction experiments with Cl_4 vapour show the distance C—I in the tetrahedral mol. to be 2.12 ± 0.02 A. The corresponding val. for CBr_4 is 1.93 ± 0.02 A.

R. C.

Crystallography of herapathite. C. D. WEST (Amer. Min., 1937, 22, 731—735).—Data for crystals found in various herapathite preps. are recorded, and their unusual optical properties are discussed.

L. S. T.

New form of resorcinol. A. R. UBBELOHDE and J. M. ROBERTSON (Nature, 1937, 140, 239).— β -Resorcinol, $a\ 7.91$, $b\ 12.57$, $c\ 5.50$ A., cell vol. $547\ \text{\AA}^3$, 4 mols. per cell, 1.327, space-group C_{2h} (Pna), is prepared by the slow evaporation of a solution in C_6H_6 at room temp. using specially-dried air. Vac. sublimation of $m\text{-C}_6\text{H}_4(\text{OH})_2$ under certain conditions gives a preponderance of β -crystals in large, shining, flakes. When cryst. from boiling C_6H_6 , $\text{C}_6\text{H}_4(\text{OH})_2$ gives good crystals of the α -form, but $\text{C}_6\text{H}_2\text{D}_2(\text{OD})_2$ (I) gives poor crystals of the β -form. On vac. sublimation (I) again behaves differently in giving a preponderance of crystals with the α -structure.

L. S. T.

Explanation of the disposition and inclination of rows of molecules in layers of organic acids according to X-rays. V. V. TSCHELINCEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 95—97).—It is suggested from a study of the fusibility curves and thermal data for systems of phenols and carboxylic acids that an oxonium bond is present, and that, by analogy, the sheets of mols. in the long-chain paraffin acids are held together by oxonium bonds between CO_2H groups $\text{R}\cdot\text{C}(\text{OH})\cdot\text{O} \leftarrow \text{O}\cdot\text{R}\cdot\text{CO}\cdot$. This would account for the inclination of the chains to the planes of the layers, as found by X-rays.

R. S. B.

X-Ray and thermal examination of $\alpha\alpha'$ -diglycerides.—See A., II, 397.

Elementary cell and space-group of ethylchlorophyllide. J. A. A. KETELAAR and E. A. HANSON (Nature, 1937, 140, 196).—X-Ray diagrams of ethylchlorophyllide prepared from the leaves of *Heracleum* by the method of Stoll give $a\ 8.90 \pm 0.02$ and $c\ 38.4 \pm 0.2$ A.; 2.7 or approx. 3 mols. per unit cell: space-group C_2^2 or C_2^3 , with the Mg atoms arranged in spirals around the c axis.

L. S. T.

Crystal structure of cellulose. H. MARK and K. H. MEYER (Z. physikal. Chem., 1937, B, 36, 232—236).—A reply to Sauter (this vol., 226).

R. C.

Molecular structure of canna starch.—See A., II, 400.

Molecular structure of and As_4O_6 by electron diffraction. L. R. MAXWELL, S. B. HENDRICKS, and (Miss) L. S. DEMING (J. Chem. Physics, 1937, 5, 626—637).— P_4O_6 has symmetry T_d and P—P separation 1.67 ± 0.03 A. The angle P—O—P is $128.5 \pm 1.5^\circ$. The As—As separation in As_4O_6 is 3.20 ± 0.05 A. The valency angle As—O—As is most probably 140° although 120° and 127.5° cannot be definitely excluded. More accurate determination is impossible on account of the scattering of As atoms. In P_4O_6 the P—O separation is 1.67 A., which is < the sum of the single bond radii (1.76 A.) and the P valency angle is approx. $98 \pm 2^\circ$, the same as the recorded vals. for black P, PCl_3 , and POCl_3 . P_4O_{10} is of lower symmetry than P_4O_6 but the P atoms appear to have approx. the same arrangement as in P_4O_6 . The diffraction pattern of P_4O_6 closely resembles that of P_4O_{10} .

W. R. A.

Standard substances for exact measurements in electron diffraction method. N. A. SCHSCHAKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 461—462).—One of the most suitable standard substances for the determination of interplanar spacings in crystals is the two-dimensional crystal of Si_2O_5 resulting from the action of electrons on clay minerals.

O. D. S.

Electron diffraction at natural faces of organic single crystals. P. A. THIESSEN and T. SCHOON (Z. physikal. Chem., 1937, B, 36, 216—231).—From measurements with $n\text{-C}_{30}\text{H}_{62}$, $n\text{-C}_{31}\text{H}_{64}$, stearic acid (I), and cetyl palmitate the dimensions of the unit cells have been determined and the internal potentials calc. The surface of a crystal of the unstable β -form of (I) may contain the stable α -form. The use of

electron diffraction measurements to determine in the case of crystals of substances of high mol. wt. which groups are outermost in the surface mols. is discussed. Combination of electron diffraction and X-ray measurements considerably enhances the expedition and trustworthiness of structure analysis investigations. R. C.

Electron-microscopic observations on field cathodes. E. W. MÜLLER (Z. Physik, 1937, 106, 541—550).—Metallic single crystals are employed as cathode in a form of high-voltage cathode-ray tube. The image on the screen, giving a picture of the electron distribution in the discharge and/or the crystal structure of the cathode, corresponds with a magnification of 2×10^6 . The c.d. of the discharge may attain 10^8 amp. per sq. cm. L. G. G.

Variation of the modulus of quartz as a function of the temperature. II. Low temperatures. A. LANGEVIN and (MLLE.) A. M. MOULIN (J. Phys. Radium, 1937, [vii], 8, 257—259; cf. this vol., 290).—The piezo-electric modulus of quartz has been measured from 23° to -60° . It remains const. between 23° and 0° but decreases linearly by 5.8% between 0° and -60° . W. R. A.

Theory of the dependence of ferromagnetic properties of metals on temperature. N. AKULOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 445—450).—Mathematical. O. D. S.

Magnetic interaction and resultant anisotropy in unstrained ferromagnetic crystals. L. W. MCKEEHAN (Physical Rev., 1937, [ii], 52, 18—30).—Mathematical. The derivation of the mutual potential energy of two equal and parallel magnets for special distributions of magnetic moment in each is applied, with special reference to higher terms, to the atoms in ferromagnetic crystals, and, for the computation of ferromagnetic anisotropy, sums to the sixth order of zonal harmonics are given. Data and results for a no. of metals and alloys are tabulated. N. M. B.

Magnetic quality of nickel wire as influenced by the surface. T. F. WALL (Nature, 1937, 140, 238; cf. this vol., 402).—Data for Ni wires in a condition of max. permeability show that the magnetic characteristic of a wire depends on its diameter. The coercive force and remanence are both greater in a wire of smaller diameter ($\frac{1}{32}$ in.). L. S. T.

Atomic moments and Curie points in solid solutions of nickel. V. MARIAN (J. Phys. Radium, 1937, [vii], 8, 313—315; cf. this vol., 297).—On addition of non-ferromagnetic elements to Ni the mean at. moment (M) and the Curie point (θ) are reduced linearly as the at. moment of added element is increased; the diminutions in M and θ are the greater the greater is the valency of the added element. When M or θ is plotted against the no. of extra-nuclear electrons in the added element for Ni alloys with Cu, Zn, Al, Sn, Sb, and Mo practically superposable, straight lines are obtained. The slope of these lines for M shows that addition of one electron decreases M by one Bohr magneton. W. R. A.

"Transformation temperature" of a metallic film. T. FUKUROI (Sci. Papers Inst. Phys. Chem.

Res. Tokyo, 1937, 32, 196—219).—The temp. at which there is an abrupt irreversible decrease of electrical resistance as a thin film is heated has been investigated by determining the change of resistance, reflexion of light, and X-ray diffraction with rise of temp. of films of Cd, Zn, Hg, Mg, Sb, Pb, and Bi condensed on glass. The results (see this vol., 358), and those of investigations of the growth of cracks in the films, can be explained as due to recrystallisation. It is suggested that the term "transformation temp." should be replaced by "recrystallisation temp." A. J. M.

Optical changes in freshly-evaporated aluminium-magnesium films. H. W. EDWARDS and R. P. PETERSEN (Physical Rev., 1936, [ii], 49, 207).—The three types of changes in reflexion and transmission that occur in these films are described. L. S. T.

Optical constants of thin gold films by means of transmission and reflexion measurements from the ultra-violet to the infra-red. F. GOOS (Z. Physik, 1937, 106, 606—619).—Au films of various thickness on quartz were prepared by cathode sputtering. From measurements of the % reflexion from both sides of the film and the % transmission, in the 265 to 1050 m μ range, vals. for n and k are obtained. L. G. G.

Optical properties and structure of thin gold films. P. J. HARINGHUIZEN, D. A. WAS, and A. M. KRUTHOF (Physica, 1937, 4, 695—702).—The reflectivity and transmission of films of known thickness was measured for $\lambda\lambda$ between 5000 and 8240 Å. The relation between structure and colour is discussed. The Au film when first formed on glass is amorphous. H. J. E.

Oblique reflexion of light at a mercury film condensed on the cold surface of glass or tin leaf. T. FUKUROI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 157—171).—The effect of thickness of a Hg film deposited on glass or tin foil at -180° on the change in intensity and degree of polarisation of light reflected obliquely from the film was determined. The results agree with those calc. on the assumption that the film is not of uniform thickness, but consists of an aggregate of isolated clusters. A. J. M.

Light absorption of metallic films at low temperatures. T. FUKUROI (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 172—186).—In order to discover the ultramicroscopic structure of metallic films, the absorption of light by Hg, Cd, and Zn films deposited on cold (-180°) quartz plates was determined. The results agree with the assumption that the surface has a granular structure (cf. preceding abstract). A. J. M.

Theory of distant diffraction. J. SAVORNIN (J. Phys. Radium, 1936, [vii], 7, 434—440; 1937, [vii], 8, 312). W. R. A.

Experimental study of distant diffraction. J. SAVORNIN (J. Phys. Radium, 1937, [vii], 8, 309—312).—Diffraction of elliptical vibrations of visible light from Cu, Au, and steel screens as functions of

incident angle and λ of incident light has been studied. W. R. A.

Nature of coercivity. E. KONDORSKI (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 457—459).—Theoretical. O. D. S.

Influence of surface state on the plasticity of crystals. A. V. STEPANOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 547—549).—Examination in polarised light of the results of a surface scratch on a crystal of rock-salt showed that this, together with the vol. change produced by it, is a source of slip, which, by causing further slips, may lead to rupture of the whole crystal. R. C. M.

Transitions in crystals having distorted lattices. G. TAMMANN (Z. anorg. Chem., 1937, 233, 286—294).—A no. of observations are summarised to show that distortions of the lattice, similar to those produced by cold-working in metals, are often present in crystals which have been formed at temp. the m.p., and are associated with modifications of various properties. When such crystals are heated, an irreversible transition to the normal state occurs over a definite range of temp. F. J. G.

Solids. G. BUSCH (Naturwiss., 1937, 25, 535—539).—A summary of papers given at a conference. A. J. M.

Ground state of the Se_2 molecule. S. S. BHATNAGAR, H. LESSHEIM, and M. L. KHANNA (Nature, 1937, 140, 152).—The vapour of diat. Se is paramagnetic, showing that the ground-level of Se_2 is $^3\Sigma$. L. S. T.

Coexistence of dia- and para-magnetism in single crystals of antimony-tin alloys. H. M. HART (Physical Rev., 1937, [ii], 52, 130—131).—The effect of adding small amounts of Sn to Sb was investigated by studying the magnetic anisotropy at room temp. The curve obtained indicates that χ_{11} (originally negative) decreases as Sn is added and finally changes sign so that the crystals become paramagnetic parallel to the trigonal axis. A theoretical explanation is discussed. N. M. B.

Dia- and para-magnetic susceptibilities [of various substances] at 2—10 oersteds. W. SCHRIEVER and R. E. SMITH (Physical Rev., 1936, [ii], 49, 408).—Data for Bi, Sb, Cd, FeCl_3 , $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, and $\text{Co}_2(\text{SO}_4)_3 \cdot 7\text{H}_2\text{O}$ are recorded. L. S. T.

Quantum theory of diamagnetism of aromatic compounds. F. LONDON (Compt. rend., 1937, 205, 28—30).—Theoretical. C. R. H.

Ferromagnetism: lowest energy levels. J. C. SLATER (Physical Rev., 1937, [ii], 52, 198—214).—Mathematical. The theory of ferromagnetism is formulated by the method of energy bands and by the method of spin waves, and the connexion between them is investigated. For studying the temp. variation of magnetisation the spin wave theory should be used, but the energy band theory leads to approx. correct conclusions as to which elements should be ferromagnetic. N. M. B.

Temperature dependence of the magnetisation of a ferromagnetic material at low tem-

peratures. W. OPECHOWSKI (Physica, 1937, 4, 715—722).—Theoretical. H. J. E.

Moments of some rare-earth cations and Weiss magnetism. B. CABRERA (Compt. rend., 1937, 205, 400—403).—Vals. of the magnetic moments of Gd^{+++} , Dy^{+++} , Ho^{+++} , and Er^{+++} are recorded. Statistical examination shows these vals. to be in better agreement with Weiss' law than with vals. calc. by quantum mechanics. A val. of 1130.0 units is deduced for the Weiss magneton. A. J. E. W.

Structure and resistance of thin metal films. D. A. WRIGHT (Nature, 1937, 140, 107—108).—The resistance-temp. curve for thin films of In (this vol., 226) indicates a transition temp. of approx. 10° , in agreement with Kramer's formula (A., 1934, 244). On the other hand, thin films of Rb and Cs do not behave in accordance with deductions based on Kramer's theory. L. S. T.

Minimum in the resistance-temperature curve of gold. W. J. DE HAAS and G. J. VAN DEN BERG (Physica, 1937, 4, 683—694; cf. A., 1936, 929).—The min. shifts with the time of annealing the wire at 500° , but is still present when the wire is annealed and measured in vac. Heating of the wire by the measuring current does not cause the min. H. J. E.

Superconducting state. II. J. C. SLATER (Physical Rev., 1937, [ii], 52, 214—222; cf. this vol., 174).—An extension of previous theoretical discussions. N. M. B.

Explanation of magnetic induction in superconductors. J. STARK and K. STEINER (Physikal. Z., 1937, 38, 597).—An additional experiment is described confirming earlier work (this vol., 292). A. J. M.

Measurements on the velocity and absorption of sound in various gases between 100° and -100° . Influence of pressure on the absorption. A. VAN IJTERBEEK and P. MARIENS (Physica, 1937, 4, 609—616).—Data for O_2 , H_2 , and CO are recorded. At low temp. vals. of the absorption coeff. are too high compared with those given by the classical formula. The latter must be corr. for the non-ideal nature of the gas. Absorption by H_2 containing 45% of para- H_2 is the same as that by ordinary H_2 . H. J. E.

Collision excitation of intramolecular vibrations in gases and gas mixtures. IV. Sound dispersion and absorption measurements in nitrous oxide and carbon dioxide at high temperatures. A. EUGEN and E. NUMANN (Z. physikal. Chem., 1937, B, 36, 163—183; cf. A., 1936, 19).—Measurements of the λ and max. absorption of ultrasonic waves at 20 — 400° , using an improved apparatus, have shown that in N_2O and CO_2 the valency vibrations are excited as readily as the deformation vibrations (cf. this vol., 21). Probably, however, it is the deformation vibrations which are excited primarily and these then rapidly transfer energy to valency vibrations. In presence of H_2O the collision no. of CO_2 passes through a min. with rising temp., whilst that of N_2O rises continually. A possible explanation is that the first (one-quantum)

deformation vibrational states of CO_2 and N_2O are excited by collision with H_2O mols. much more readily than the higher quantum states. The results indicate that in general the direct transfer of vibrational energy from mol. to mol. is very little impeded.

R. C.

Intensity and polarisation of the light diffracted by supersonic waves in solids. H. MUELLER (Physical Rev., 1937, [ii], 52, 223—229).—Intensity and polarisation are calc. by considering the photoelastic effect due to the strains created by the elastic waves. For natural incident light the diffracted light is partly polarised. In glasses and cubic crystals the diffracted light is partly depolarised if the incident light is polarised. Intensities are calc. by Raman's theory (cf. A., 1936, 148) and results are compared with available experimental data.

N. M. B.

Ratio of specific heats of air, nitrogen, and carbon dioxide as a function of pressure, by the ultrasonic method. J. C. HUBBARD and A. H. HODGE (Physical Rev., 1936, [ii], 49, 194).—Ultrasonic velocities at 27° and at pressures from 1 to 60 atm. for CO_2 and to 100 atm. for air and N_2 have been determined. Vals. of γ for pressures $>$ atm. are recorded.

L. S. T.

Entropy of methane. A. FRANK and K. CLUSIUS (Z. physikal. Chem., 1937, B, 36, 291—300).—The mol. heat of the solid has been measured at 15 – 26° abs. The mol. heat of the transition at 20.4° abs. is 15.6_6 g.-cal., and the mol. heat of vaporisation at 99.5° abs. 2036 ± 3 g.-cal. From these data it is calc. that the caloric entropy at the b.p. (111.5° abs.) for the ideal gaseous state is 36.53 ± 0.10 ; the statistical entropy is 36.61 , the chemical const. being $i_k - 1.91_6$, and the v.-p. const. $i_p - 1.94_1$. It is inferred that there are no irregularities in the mol. heat-temp. curve, e.g., there is no transition point below 10° abs. A plausible explanation of these observations is that in the lattice the three-term systems of the mol. lose their significance and that in respect of energy distribution all the mol. movements must be represented by a continuum. CD_4 has transition points at 22° and 26.3° abs.

R. C.

Absolute entropy values for gases. F. A. F. SCHMIDT (Forsch. Ing.-Wes., 1937, 8, 91—99).—Vals. for technically important gases, e.g., N_2 , H_2 , etc., deduced from calorimetric data are reviewed and shown to be in agreement with those derived from spectrographic data. The sp. heats up to 3000° are tabulated for H_2 , N_2 , O_2 , CO , NO , etc.

R. B. C.

Calculation of the heat capacity curves of crystalline benzene and hexadeuterobenzene. R. C. LORD, jun., J. E. AHLBERG, and D. H. ANDREWS (J. Chem. Physics, 1937, 5, 649—664).—The heat capacity curve for C_6H_6 has been calc. using the vals. of internal frequencies proposed (this vol., 175) and agrees with experimental data. This close agreement indicates that fundamental frequencies $< 400 \text{ cm}^{-1}$ are most probably absent in C_6H_6 . Calculations made using vals. for two proposed fundamentals $< 400 \text{ cm}^{-1}$ give a curve which differs considerably from the experimental curve. Vals. for C_6D_6 are given.

W. R. A.

Temperature variation of some thermodynamic quantities. G. M. MURPHY (J. Chem. Physics, 1937, 5, 637—641).—The quantity $(F^\circ - E_0^\circ)/T$, calc. from spectroscopic data, has been fitted to a five-const. equation in T for 19 mols. It may be used to interpolate vals. for S° , F° , H° , and C_p° between 298° and 3000° abs. The equilibrium const. for isotopic exchange reactions exhibits max. or min. and therefore there is an optimum temp. for isotopic separation by means of these reactions.

W. R. A.

Determination of latent heats of vaporisation of the selenides of cadmium and mercury and zinc telluride from the absorption spectra of their vapours. L. S. MATHUR (Indian J. Physics, 1937, 11, 177—185).—The latent heats of vaporisation of CdSe , HgSe , and ZnTe calc. from the long- λ limits of the absorption spectra are 39.40 , 83.23 , and 61.78 kg.-cal.

F. J. L.

Transitions in solid hydrides and deuterides. A. KRUIS, L. POPP, and K. CLUSIUS (Z. Elektrochem., 1937, 43, 664—666; cf. this vol., 450).—Whereas CH_4 has only one transition point (at 20.4° abs.) CD_4 shows two transition points, at 21.4° and 26.3° abs., respectively. This anomaly is discussed. M.p., latent heat of fusion, triple point temp., heat of transition, and transition temp. data for CH_4 , CD_4 , H_2S , D_2S , H_2Se , and D_2Se are tabulated and compared.

J. W. S.

Melting of mercury. A. SMITS and G. J. MULLER (Z. physikal. Chem., 1937, B, 36, 288—290).—Measurement of the vol.-temp. curve of highly purified Hg over a temp. range including the m.p. showed the curve not to be discontinuous at the m.p. and that melting occurred over a temp. range of 0.024° . It is considered that the melting of pure Hg would be a discontinuous process.

R. C.

Orbital intensity of interaction in combinations of multiple ionisation. R. FORRER (Compt. rend., 1937, 204, 1717—1719).—Theoretical. The m.p. (T) is related to the no. of points of contact (N) of an ion with its neighbours and the valency (v). With const. N , $T \propto v$, as in the series of fluorides, oxides, nitrides, and carbides of NaCl-like structure, for which T is approx. 1000° , 2000° , 3000° , and 4000° , respectively.

R. S. B.

Calculation of m.p. of $\alpha\omega$ dibasic acids. C. L. TSENG, C. E. SUN, and C. Y. CHEN (J. Chinese Chem. Soc., 1937, 5, 202—203).—The empirical relation $\theta - 117 = 19.5[e^{-2(n-5)a} + (-1)^n 2e^{-(n-5)a}]$, where a is a const. and n = no. of C atoms, agrees fairly well with the observed m.p.

R. C.

Theory of the λ -point of helium. H. FROHLICH (Physica, 1937, 4, 639—644).—Theoretical. The transition point is considered analogous to the transition in alloys from the "ordered" to "disordered" state.

H. J. E.

Relation between atomic radii and b.p. C. Y. CHEN, C. L. TSENG, and C. E. SUN (J. Chinese Chem. Soc., 1937, 5, 193—201).—The empirical relation $T - a + bV + cV^3$, where $V = \Sigma nr^3$ and T is the b.p., n the no. of atoms of a given element in the mol. and r the at. radius of that element, and a , b , c are

consts. for the members of a given homologous series, agrees with experimental data. R. C.

Vapour pressure of camphor. J. H. DE WILDE (Z. anorg. Chem., 1937, 233, 411—414).—Vals. of the v.p. of the solid from 338.3° to 453.5° abs. and of the liquid from 451.2° to 505.5° abs. are given. Interpolation formulæ: solid, $\log p = -2652.1/T + 7.4382$; liquid, $\log p = -2318.5/T + 7.7046$. The heats of vaporisation, sublimation, and fusion are respectively 12.12, 10.60, and 1.52 kg.-cal. per g.-mol., the triple point is at 453.2° abs. and 385.8 mm., the mol. depression of the f.p. is 411.1, and the b.p. is 480.6° abs. F. J. G.

Critical constants of the inert gases and of hydrogen compounds having the same number of electrons per molecule. G. WOOLSEY (J. Amer. Chem. Soc., 1937, 59, 1577—1578).—A linear relation is obtained when d_c/M is plotted against p_c/t_c .

E. S. H.

Energy theory of gases. F. MICHAUD (J. Chim. phys., 1937, 34, 333—350; cf. A., 1936, 19).—The thermodynamical properties of an element, defined as a pure gas in the state of max. dissociation, are implicit in the statement that corresponding masses (i.e., masses m , m' , in the ratio of the at. wts.) of two elements under the same conditions of temp. and pressure occupy the same vol. and contain quantities of entropy which differ only by a const. When the substances have, in the solid state, well defined characteristic temp., T_c , T_c (*loc. cit.*), the difference between the at. entropies is $mS - m'S' = 3/2 \cdot R \log T_c'/T_c$, and since mT_c is nearly the same for many elements, $mS - m'S' = 3/2 \cdot R \log m/m'$. Other thermodynamical relations and the criteria for reversible and irreversible chemical change are considered. J. G. A. G.

Persistence of the liquid state of aggregation above the critical temperature. Ethylene. O. MAASS and A. L. GEDDES (Phil. Trans., 1937, A, 236, 303—332).—A technique for determining accurately the pressure-temp.-vol. relationships of substances near the crit. point at <150° and <75 atm. has been developed. The pressure of the C_2H_4 was controlled to ± 0.01 atm. by means of a Hg piston operated by varying the temp. of liquid CO_2 in equilibrium with its vapour. The crit. temp., θ_c , of C_2H_4 is $9.50 \pm 0.01^\circ$ and the crit. pressure is 49.98 atm. The persistence of a discontinuity of d above θ_c is not due to the wt. of the medium itself, but is destroyed by isothermal expansion or compression and by small periodic changes ("fluctuations") of temp. about a mean val., and once destroyed, is not restored by pressure changes alone. Temp. "fluctuations" change d . The discontinuity of d found about θ_c may be due to the persistence of the liquid state if this has dynamical structure. J. G. A. G.

Proof of the theorem of corresponding states through the straight mean line equation. T. PINTER (Z. Elektrochem., 1937, 43, 669—681).—Mathematical. The theoretically deduced physical consts. are compared with experimental data for a no. of liquids. J. W. S.

Liquid state. II. M. SURDIN (J. Phys. Radium, 1937, [vii], 8, 294—302; cf. this vol., 125).—A further consideration of the "unique curve" obtained by plotting vals. of various static properties of liquids under a pressure equal to its saturated v.p. as a function of a suitable reduced temp. expression. The expression $\theta = (T - T_0)/(T_c - T_0)$ is more suitable than the van der Waals expression.

W. R. A.

Radiometer effect at low pressures. E. FREDLUND (Ann. Physik, 1937, [v], 30, 99—112).—The construction of a Knudsen manometer sensitive down to 2×10^{-7} mm. is described. Tests with He, H_2 , D_2 , A, N_2 , and O_2 show that the sensitivity varies slightly with different gases owing to differences in accommodation coeff. O. D. S.

Mean free path for gas beams in mercury vapour. J. A. ELDRIDGE (Physical Rev., 1936, [ii], 49, 411).—Vals. determined for the mean free paths at one bar Hg v.p. are He 12.5, H_2 6.85, N_2 5.8, CO_2 5.3, and C_2H_6 5.2 cm. They are slightly < would be predicted from η data on classical lines.

L. S. T.

Thermal conductivity of potassium bromide, potassium chloride, and silica at low temperatures. W. J. DE HAAS and T. BIERNASZ (Physica, 1937, 4, 752—756).—KBr and KCl show a min. in thermal resistance at approx. 7° abs. The effect resembles that for SiO_2 . H. J. E.

Chemical theory of gases. III. The molecules $(O_2)_2$ and $(NO)_2$. J. DUCLAUX (J. Phys. Radium, 1937, [vii], 8, 277—280).—The differences between the compressibilities of real and perfect gases have been attributed to the formation of double mols. (A., 1927, 927) and the existence of the mols. $(O_2)_2$ and $(NO)_2$ is postulated. The extension of the theory is discussed. W. R. A.

Calculation of lengths of extended molecules of low mol. wt. from the specific viscosity of their solutions. I. SAKURADA (Naturwiss., 1937, 25, 523).—An equation connecting the length of a mol. with the concn., η , and mol. wt. of the substance in solution is derived, and applied to the calculation of the lengths of mols. of paraffins. The results agree with vals. based on the constitution of the mols., and the assumption that the mols. are extended.

A. J. M.

Calculation of the lengths of particles of polymerised compounds from the specific viscosity of their solutions. I. SAKURADA (Naturwiss., 1937, 25, 523—524).—An equation connecting mol. wt., degree of polymerisation, η , concn. of solution, and the length of the mol. is derived, and applied to solutions of paraffin wax in C_6H_6 . The results agree satisfactorily with those obtained by X-ray methods. The equation is also applied to cellulose acetates. A. J. M.

Diffusion coefficient of methane and air. H. F. COWARD and E. H. M. GEORGESON (J.C.S., 1937, 1085—1087).—The coeff. of interdiffusion of CH_4 and air is $D_{0.760 \text{ mm.}} = 0.196 \text{ cm.}^2 \text{ per sec.}$ J. G. A. G.

Thermal diffusion in gas mixtures. II. M. PUSCHNER (Z. Physik, 1937, 106, 597—605; cf. A.,

1934, 1063).—Data for thermal diffusion in the gas mixtures H_2 - CO_2 , H_2 - N_2 , He-Ne, and He-A are given and lead to vals. for the exponent in the law of force of repulsion between mols. The exponent has the vals. 10 and 15 for Ne and A, respectively.

A. E. M.

Densities of mixtures of light and heavy water. L. G. LONGSWORTH (J. Amer. Chem. Soc., 1937, 59, 1483—1484).—Data for 25° are recorded. There is no appreciable change of vol. on mixing. A relation between composition and d is derived.

E. S. H.

Deviations of ortho- and para-hydrogen from the laws of ideal solutions. F. G. BRICKWEDDE and R. B. SCOTT (Physical Rev., 1936, [ii], 49, 194).—Differences in the v.p. of liquid mixtures of *o*- and *p*- H_2 containing up to 75% *o*- H_2 have been measured from 14° to 20.4° abs. and for solid mixtures from 10.5° to 14° abs., and the differences in latent and sp. heats calc. Data for 20.4° abs. are recorded. An explanation of the v.p. differences of *o*- and *p*- H_2 based on energy differences associated with intermol. forces of orientation is advanced.

L. S. T.

Deviations of carbon tetrachloride and silicon tetrachloride solutions from Raoult's law. S. E. WOOD (J. Amer. Chem. Soc., 1937, 59, 1510—1514).—V.p. and fugacities at 25° of the system CCl_4 - $SiCl_4$ have been determined. The deviations from Raoult's law are positive, but < those calc. from Hildebrand and Wood's equation (A., 1934, 146).

E. S. H.

Cohesive energy of liquid mixtures. I. A. J. STAVERMAN (Rec. trav. chim., 1937, 56, 885—890).—Allowance is made for variations in the size and shape of molecules by the use of an interaction const. (s_{12}) in computing the heat of mixing (H) of two liquids. The expression derived is $H = -N_1N_2[\sqrt{L_1} - \sqrt{(s_{12}L_2)}]^2/(N_1s_{12} + N_2)$, in which N and L denote the respective mol. fractions and heats of vaporisation. The formula gives satisfactory constancy for s_{12} when tested by the published data for 10 different mixtures at different vals. of N_1/N_2 . It is valid only for mols. of small polarity.

F. L. U.

Conductivity and viscosity of the systems H_2SO_4 - $CHCl_2$ - CO_2H and H_2SO_4 - CH_2Cl - CO_2H . V. TARTAKOVSKAJA, J. BONDARENKO, and L. JEMELJANOVA (Acta Physicochim. U.R.S.S., 1937, 6, 609—624).—The viscosities (η) and sp. conductivities (κ) have been determined at 20°, 40°, and 60°, and for the system H_2SO_4 - CH_2Cl - CO_2H also at 80°, and the mol. conductivities are calc. For each system η and κ pass through a max. with changing concn., this being attributed to interaction between the components, in which the $CHCl_2$ - CO_2H and CH_2Cl - CO_2H act as bases, in accord with previous observations (A., 1929, 138; 1936, 22).

J. W. S.

Heats of reaction and specific heats of aniline-*o*-chlorophenol mixtures and a test of Macleod's viscosity equation. C. D. ELLYETT (Trans. Faraday Soc., 1937, 33, 1218—1224).—The heats of reaction and sp. heats of NH_2Ph -*o*- C_6H_4Cl -OH mixtures have been measured at 25°, 35°, and 78°. The extent of compound formation, calc. by the law of

mass action, is in accord with that deduced from Macleod's equation (A., 1934, 723) at higher, but not lower, temp. No support is obtained for Macleod's theory of increasing heat of reaction with rising temp. (A., 1935, 704).

J. W. S.

Solvent effect in dielectric polarisation. I. Polarisation of nitrobenzene and chlorobenzene in certain ethers. II. Positive solvent effect of butyl and amyl ethers. G. THOMSON (J.C.S., 1937, 1051—1057).—I. Dielectric consts., ϵ_{25} , and d for mixtures of C_6H_6 with Pr_2O , Bu_2O , and amyl ether (I), have been determined at 25° for the entire ranges of concn. The polarisations vary little with concn., and the vals. of ϵ_g are: Pr_2O 4.0, Bu_2O 3.1, (I) 2.8. Vals. of ϵ_{25} and d for solutions of $PhNO_2$ and $PhCl$ in these ethers and in CS_2 have been determined. For the ethers, the polarisations deduced are consistent with the results obtained in other solvents. The relationships between vals. of ϵ for the solvents and the corresponding vals. of ∞P_0 for a solute proposed by Jenkins (A., 1934, 585), Frank (A., 1936, 150), and Higasi (A., 1936, 550) are not linear for polar solvents, but that between ∞P_0 and $(\epsilon - 1)^2$ is linear for polar and non-polar solvents but leads to extrapolated vals. for the gaseous state < those observed.

II. The polarisations of Bu_2O and (I) in C_6H_6 and C_6H_{14} decrease with decreasing ϵ of solvent as has been predicted for substances with negative vals. of the Kerr const.

J. G. A. G.

Viscosity of hydrocarbon solutions. Methane-propane-crystal oil system. B. H. SAGE, B. N. INMAN, and W. N. LACEY (Ind. Eng. Chem., 1937, 29, 888—892).—The effect of pressure and composition on the η of the liquid phase of a part of the CH_4 - C_3H_8 -crystal oil system has been studied by using a modified rolling-ball viscosimeter. The observations, limited to 37.8° and to liquid compositions containing <5% CH_4 and 20% C_3H_8 , were made in both the two-phase and condensed-liquid regions at pressures up to 3000 lb. per sq. in. The results are tabulated, and several graphs illustrate the behaviour of the system.

H. C. M.

Diffusion of beryllium salts in aqueous solution. L. W. ÖHOLM (Finska Kem. Medd., 1937, 66, 71—78).— η has been measured for 0.1—4.0N solutions of $BeCl_2$, $Be(NO_3)_2$, and $BeSO_4$.

M. H. M. A.

Electrical conductivities and viscosities at 25° of solutions of potassium, sodium, and lithium chlorides, in water and in one-tenth molar hydrochloric acid. L. NICKELS and A. J. ALLMAND (J. Physical Chem., 1937, 41, 861—872).—In general, the data for Λ (except at low concns.), d , and η agree with published data. At low concns. the new Λ vals. are higher. The val. for $\Lambda\eta$ for $LiCl$ solutions is independent of $[LiCl]$ above 4N, whilst for $NaCl$ solutions the val. for $\Lambda\eta$ passes through a flat min. at approx. 3N, only varying slightly over the range 1.5—5N. The constancy of the vals. for $\Lambda\eta$, corr. in the case of the HCl solutions for Λ and η due to HCl , is discussed in the light of the views of Bernal and Fowler (cf. A., 1934, 13).

C. R. H.

Diffusion of one-tenth molar hydrochloric acid through aqueous solutions of potassium, sodium, and lithium chlorides. L. J. BURRAGE and A. J. ALLMAND (J. Physical Chem., 1937, 41, 887—894).—Diffusion coeffs., D , have been measured at various temp. and recalcd. to 25°. Vals. for D_{η} increase with the chloride concn., max. vals. of 6.8—6.9 being obtained at 1.3—1.5 mol. Below this concn. the D_{η} -concn. curves are approx. coincident, but at higher concns. the curves separate and in the case of NaCl pass through a min. val. at approx. 4.7 mol. The data are discussed. C. R. H.

Vapour pressure of saturated aqueous solutions of dihydroxybenzenes. P. DINGEMANS (Rec. trav. chim., 1937, 56, 839—852).—Data are recorded for the range 15°—m.p. (*o*- and *m*-), and 15—90° (*p*-). Max. are shown at 82.0° and 162.6 mm. (*o*-), and 85.0° and 141.0 mm. (*m*-). The curve for $p\text{-C}_6\text{H}_4(\text{OH})_2$ shows no max. in the range studied. V.p. vals. have also been determined for solutions saturated with respect to binary mixtures having the eutectic composition, all three of which exhibit max. Eutectic temp. are as follows: *o*- + *m*- 70.8 ± 0.1°; *o*- + *p*- 92.3 ± 0.1°; *m*- + *p*- 93.7 ± 0.4°. The complete f.p. curve is given for *o*- + *m*- $\text{C}_6\text{H}_4(\text{OH})_2$. F. L. U.

Metals and alloys. XXIV. Constitution of sodium-gold alloys. W. HAUCKE (Z. Elektrochem., 1937, 43, 712—719; cf. this vol., 127).—Extraction of Au-Na alloys rich in Na with liquid NH_3 yields crystals of the γ -phase AuNa_2 , of tetragonal structure, similar to CuAl_2 and having a 7.402, c 5.551 Å. A third phase of unidentified structure exists in this system, but is probably stable only at higher temp. J. W. S.

Roentgenographic study of alloys of magnesium and silver. N. V. AGEEV and V. G. KUZNETZOV (Bull. Acad. Sci. U.R.S.S., 1937, 289—311).—Four phases may be distinguished by X-ray methods: α (>25 at.-% Mg), β (47—55 at.-% Ag), γ (20—25 at.-% Ag), and δ , consisting respectively of solid solutions of Mg in Ag, Mg or Ag in AgMg , Mg in AgMg_3 , and Ag in Mg. Crystal lattice parameters are recorded. R. T.

Velocity of polymorphic transformation of the compound MgCd in the system magnesium-cadmium. I. I. KORNILOV (Bull. Acad. Sci. U.R.S.S., 1937, 313—331).—Hardness, conductivity, and microstructural changes indicate that the transition point of α - to β - MgCd is at 258°. The hardness of the alloys increases to a max. during the transformation, owing to internal stresses involved in the rearrangement. R. T.

β - and γ -phases of the system Al-Mg. N. S. KURNAKOV and V. I. MICHEEVA (Bull. Acad. Sci. U.R.S.S., 1937, 259—288).—It is concluded from conductivity, temp. coeff. of conductivity, thermal e.m.f., hardness, and m.p. measurements, and crystallographic data for the system Al-Mg that the β -phase consists of a highly dissociated compound of unknown composition in equilibrium with its dissociation products, whilst the γ -phase consists similarly of Al_3Mg_4 with its dissociation products. R. T.

X-Ray investigation of the system manganese-arsenic. I. N. NOWOTNY and F. HALLA (Z. physikal. Chem., 1937, B, 36, 322—324).—The phases MnAs , with the NiAs or related rhombic structure, and Mn_2As with a tetragonal lattice and the space-group together with a third phase, probably Mn_3As , have been observed. R. C.

Separation process in the crystallisation of Cu-Pb and Cu-Pb-X alloys (binary and poly-component lead bronzes). W. CLAUS (Z. Elektrochem., 1937, 43, 502—503).—Mixtures of Cu and Pb containing 37—93% of Pb are not completely miscible in the liquid state, and therefore the properties of solid alloys in this range of composition vary with the conditions of crystallisation. Similar properties are observed in Cu-Pb alloys containing other metals, with the additional phenomenon that the secondary components, which tend to remain in the melt, can be deposited in the zone of initial crystallisation. Thus an alloy containing Cu 7.35, Pb 15, Zn 10, and Ni 1.5%, cast into a cylinder, yielded an outermost layer containing Pb 91.7, Zn 5.1, Cu 1.4, and Ni 1.8% and an innermost layer containing Cu 79.2, Zn 10.6, Pb 8.9, and Ni 1.3%. The effect is attributed to liberation of H_2 during crystallisation. J. W. S.

Crystal structure of alloys of zinc with the alkali and alkaline-earth metals and of cadmium with potassium. J. A. A. KETELAAR (J. Chem. Physics, 1937, 5, 668).—X-Ray observations indicate that the alloys of Zn with Na, K, Ca, Sr, and Ba and of Cd with K have the same cubic lattice structure. The no. of atoms in the elementary cell are 111, 113, and 111, respectively for KCd_{13} , NaZn_{13} , and CaZn_{13} . The space-group is either O_h^2 or T_d^2 . W. R. A.

Lattice relationships developed by peritectic formation of β in the copper-zinc system. A. B. GRENINGER (Amer. Inst. Min. Met. Eng., Tech. Publ. 787, 1937, 12 pp.).—Results of an investigation based on X-ray analysis are discussed. R. B. C.

Alloys for use at high temperatures. IV. Constitution of the alloys of nickel, chromium, and iron. C. H. M. JENKINS, E. H. BUCKNALL, C. R. AUSTIN, and G. A. MELLOR (Iron and Steel Inst., Sept., 1937. Advance copy, 34 pp.).—The solidus of the Ni-Fe system, and the liquidus and solidus above 800° of the Ni-Cr and Ni-Cr-Fe (up to 50% Cr) systems, have been re-investigated. An equilibrium diagram for the ternary alloys containing up to 50% Cr has been constructed from the results and existing data. C. E. H.

Composition of the quaternary phase in the system Al-Cu-Mg-Si. D. A. PETROV (Acta Physicochim. U.R.S.S., 1937, 6, 505—512).—The measurements of Dix *et al* (Trans. Amer. Inst. Min. Eng., Inst. Met. Div., 1932, 99, 119) suggest that the limits of the at. ratios in the quaternary phase Al-Cu-Mg-Si are Mg:Si — 1—1.33 and Cu:Si = 0.74—1.10 and that probably Cu:Mg:Si is approx. 4:5:4. Hence in ordinary duralumin containing >0.5% of Si, Mg_2Si must coexist with the quaternary phase, whilst in superduralumin type alloys (C17S and 14S) free Si is present. J. W. S.

Limits of stability of intermetallic phases. F. HALLA (Z. Elektrochem., 1937, 43, 558—560).—It is assumed that d for an intermetallic phase does not lie far outside the limits set by the vals. of d for the components. Since the d for an unknown phase of definite composition can be calc. by interpolation or extrapolation from the vals. for neighbouring isomorphous compounds, it can be predicted that such phase will be unstable if the calc. d lies outside these limits. The non-existent combinations among compounds of the types XY and X_2Y ($X = \text{Mn, Fe, Co, Ni, Cu}$; $Y = \text{P, As, Sb}$) accord with this criterion. FeSb_2 forms an exception to the rule and is discussed. J. W. S.

Heat of formation of binary and ternary alloys and their significance for metallurgical reactions. W. OELSEN (Z. Elektrochem., 1933, 43, 530—535; cf. B., 1936, 993).—The heats of formation of Fe-Sb , Co-Sb , Ni-Sb , Fe-Al-Si , and Cu-Ni-Al alloys have been determined over the complete concn. range. The heat contents and heats of mixing of various melts are deduced. The application of the data in metallurgy is discussed. J. W. S.

Ferromagnetic moments of some cobalt alloys. T. FARCAS (Ann. Physique, 1937, [xi], 8, 146—152).—The magnetic properties of Co-Cr , Co-Al , Co-W , and Co-Mo alloys have been investigated. For Co-Cr alloys the saturation vals. for different field strengths are given, and the at. moment is calc. The variation of the latter with composition is nearly linear. Extrapolation of the curve to pure Co gives the val. of Weiss magnetons, which is the val. for cubic Co obtained by other methods, and not, as might have been expected, that of hexagonal Co (8.5), in which form the alloys crystallise at the temp. of the experiment. The at. moments of Co-Mo alloys also give the val. 9 Weiss magnetons for Co on extrapolation, but those of Co-Al and Co-W alloys extrapolate to 8.5 Weiss magnetons. A. J. M.

Magnetic susceptibility of copper amalgam. H. S. VENKATARAMIAH (Proc. Indian Acad. Sci., 1937, A, 5, 532—534; cf. A., 1936, 1329).—Vals. of χ for amalgams containing $\geq 3\%$ Cu are $<$ those corresponding with the mixture law, indicating that amalgamation increases the effective no. of free electrons. χ for pure $\text{Hg} = -0.170 \times 10^{-6}$. A. J. E. W.

Magnetic properties of alloys of iron with ruthenium and osmium. M. FALLOT (Compt. rend., 1937, 205, 227—230).—The Curie points, at. moments, and α - γ transformation temp. are given for alloys containing 0—15 at.-% Ru and Os . The α -ferromagnetic state occurs with $\geq 14\%$ Ru or 11% Os . A. J. E. W.

X-Ray investigation of the anomalous solid solutions of ammonium chloride with the chlorides of manganese, cobalt, and nickel which are formed in aqueous solution. V. G. KUZNETZOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 469—471; cf. Gruner and Sieg, A., 1936, 1477).—For solid solutions containing 25—30% $\text{M}^{\text{II}}\text{Cl}_2$ ($\text{M} = \text{Co, Mn, or Ni}$) lines corresponding with both the NH_4Cl and with the double salt lattice can be seen

in the X-ray diffraction patterns. The most intense NH_4Cl lines are visible up to 48—49% $\text{M}^{\text{II}}\text{Cl}_2$ but disappear above 57% CoCl_2 . At 61.1% CoCl_2 , lines corresponding with $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ were observed. The lattice const. of NH_4Cl decreases with increasing $[\text{M}^{\text{II}}\text{Cl}_2]$. The variation in the interplanar spacing of the double salt with changing concn. of the solid phase is recorded. O. D. S.

Critical opalescence of liquid mixtures. R. S. KRISHNAN (Proc. Indian Acad. Sci., 1937, A, 5, 577—593).—Roussset's theory of secondary scattering (cf. A., 1934, 830, 1302) is reviewed and extended, and is not in accord with experimental results. Data obtained for the depolarisation of scattered light in three binary mixtures and one ternary mixture at temp. $\geq 30^\circ$ above the crit. solution temp. (T_{cs}) confirm the existence of mol. clusters. Gans' theory is discussed in relation to this and other anomalous phenomena occurring in the neighbourhood of T_{cs} . A. J. E. W.

Influence of admixtures on the mutual solubility of liquids. P. JANKELEVITSCH (Trav. Inst. Chim. Charkov, 1935, 1, 163—223).—The temp.-solubility curves of PhOH in H_2O have been determined in presence of NaCl , CoCl_2 , FeCl_3 , and a no. of complex salts of Co . The influence of these salts is evident only at high $[\text{PhOH}]$ and the action of the salts diminishes with increasing ionic radius. The theoretical aspects of the problem are discussed. R. T.

Solubility of gases in mixtures of water and non-electrolytes. A. VON KISS, I. LAJTHAI, and G. THURY (Z. anorg. Chem., 1937, 233, 346—352).—The solubilities of CO_2 and H_2S in mixtures of H_2O with EtOH , $\text{C}_2\text{H}_5\text{O}_2$, $\text{CO}(\text{NH}_2)_2$, and glycerol have been determined. The solubility, its temp. coeff., and the heat of dissolution all vary with the concn. of the non-electrolyte, but no simple relationship has been found. F. J. G.

Solubility of sulphur dioxide in calcium hydrogen sulphite solutions. F. H. CONRAD and W. L. BEUSCHLEIN (Paper Trade J., 1937, 105, TAPPI Sect., 67—70).—A method for ascertaining the solubility of SO_2 in aq. solutions of $\text{Ca}(\text{HSO}_3)_2$ up to saturation is described; the results are compared with published data. H. A. H.

Solubility of noble metals at high pressures. I. Dissolution of platinum metals in hydrochloric acid under air pressure. V. G. TRONEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 555—558).—The view that the dissolution of Pt in HCl in the presence of air without evolution of H_2 involves the reactions $2\text{HCl} + \text{O} \rightarrow \text{H}_2\text{O} + \text{Cl}_2$, $\text{Pt} + \text{Cl}_2 + 2\text{HCl} \rightarrow \text{H}_2\text{PtCl}_6$, receives qual. support from the fact that the rate of dissolution increases as the air pressure, $[\text{HCl}]$, and temp. increase. Both Pt and Au can be dissolved in HCl in presence of H_2O_2 ; Ir and Rh dissolve to some extent after treatment for several hr. in an autoclave under pressure. R. C. M.

Solubility of dicarboxylic acids. J. H. C. MERCKEL (Rec. trav. chim., 1937, 56, 811—814; cf. this vol., 406).—Solubilities (s) in H_2O of acids of the malonic series (up to azelaic) can be expressed by

$\log s = a - bn(n-1)$, where n = no. of C atoms. a and b have different vals. for the even and uneven members, and are greater for the latter. F. L. U.

Solubility of halogenated hydrocarbon refrigerants in organic solvents.—See A., II, 395.

Solubility of salts of fatty acids in mixed solvents. I. System barium acetate-ethyl alcohol-water, at 25°. E. JÓZEROWICZ and T. CHO-
WIENCZYK (Rocz. Chem., 1937, 17, 314—318).—Solubility data are recorded for the system at 25°. The solid phases are $\text{Ba}(\text{OAc})_2$ and its monohydrate.
R. T.

Colorimetric test of the solubility equation for regular solutions. R. D. VOLD (J. Amer. Chem. Soc., 1937, 59, 1515—1521).—Apparatus and technique for measuring the heat capacities and heats of mixing of corrosive liquids, which must be kept in a closed system to avoid decomp., are described. The heat capacities and heats of formation of the mixtures CCl_4 - SiCl_4 , CCl_4 - C_6H_6 , CCl_4 - n - C_7H_{16} , and C_6H_6 - n - C_7H_{16} and the heat capacities of the mixtures SnCl_4 - CCl_4 and of all the pure components have been determined at 25°. An equation for calculating the heat of mixing has been derived. E. S. H.

Highly polymerised compounds. CLXIII. Solubility and precipitability of substances of high mol. wt. G. V. SCHULZ (Z. physikal. Chem., 1937, 179, 321—355).—It has been deduced theoretically that if a substance with the degree of polymerisation P is distributed between a pure solvent and a mixture of a solvent with a precipitant (concn. γ) $\log_e (c_1/c_2) = -P(A + B\gamma)/RT$, where c_1 and c_2 are the concns. in the pure solvent and in the mixture, respectively, and A and B are consts. The approx. relation $s = Ke^{-P(A+B\gamma)/R\theta}$, where θ is a function of the temp. and A , B , and K are consts., has been obtained for the solubility, s , in a mixture of solvent and precipitant. For a given temp. this becomes $\log_e s = a - b\gamma$ (a and b are consts.). The precipitability, measured by the concn. g , of precipitant sufficient just to start pptn., must be a linear function of $1/P$, so that P can be calc. from g . g is practically independent of the degree of branching of the mol. chain and rises linearly with the temp. It seems that some or all of A , B , and K are influenced by temp. The above theoretical deductions are supported by experimental data published previously. It is inferred that solutions of highly polymerised solutes do not differ fundamentally from those of solutes of low mol. wt. and that the same theory is applicable to both.
R. C.

Determination of adsorption isotherms of hydrogen on charcoal between 90° and 50° abs., in connexion with desorption experiments. A. VAN ITTERBEEK and W. VAN DINGENEN (Physica, 1937, 4, 617—618; cf. this vol., 357).—Corrections are applied to previous calculations for the cooling of the adsorbed H and for the ortho-para- H_2 conversion.
H. J. E.

Adsorption of oxygen on glass at liquid oxygen temperatures. A. VAN ITTERBEEK and W. VAN DINGENEN (Physica, 1937, 4, 631—638).—Measurements are recorded at 90.0° and 67.3° abs.

and 10⁻²—1 mm. The results are expressed by $X^2 = k_1 k_2 p / (1 + k_2 p)$, X being the quantity adsorbed per sq. cm., p the pressure, and k_1 and k_2 consts.

H. J. E.

Adsorption of benzene vapour from a current of air. P. K. MIGAL and V. A. GOLOVTSCHENKO (Trav. Inst. Chim. Charkov, 1936, 2, 157—163).— SiO_2 gel and active C differ in possessing high adsorptive capacity and velocity, respectively; a combination of the two adsorbents gives better results with respect to elimination of C_6H_6 from air than when each is taken separately. The activity of SiO_2 gels rises with increasing $[\text{HCl}]$ used for their pptn.
R. T.

Use of low-temperature van der Waals adsorption isotherms in determining the surface area of iron synthetic ammonia catalysts. P. H. EMMETT and S. BRUNAUER (J. Amer. Chem. Soc., 1937, 59, 1553—1564).—Adsorption isotherms for 6 different catalysts have been determined with N_2 and A at -195.8°; N_2 , A, CO, and O_2 at -183°; CH_4 and NO at -140°; N_2O and CO_2 at -78°; NH_3 at -36°; and n -butane at 0°. These measurements, in combination with data for the chemisorption of CO by the catalysts at -183° and -78° and for the activated adsorption of H_2 , are used in the calculation of the abs. and relative surface areas of the catalysts. Al_2O_3 promoters tend to concentrate at the surface of the catalysts.
E. S. H.

Adsorption on gels. II. Comparative study of the capillary spaces in gels of silica and alumina. K. S. RAO and B. S. RAO (Proc. Indian Acad. Sci., 1937, 6, A, 16—23; cf. this vol., 129).—Adsorption of H_2O vapour on "glassy" and "chalky" SiO_2 gels and of $\text{C}_5\text{H}_5\text{N}$ vapour on Al_2O_3 gels activated at 400°, 500°, and 850° has been studied. The observed differences are discussed with reference to variations in capillary size.
C. R. H.

Selective adsorption on silica gel from pyridine-alcohol mixtures. N. VENKATANARASIMHACHAR and K. S. G. DOSS (Proc. Indian Acad. Sci., 1937, 6, A, 32—35).—Data for the whole range of $\text{C}_5\text{H}_5\text{N}$ -EtOH mixtures have been derived from the change in n of the mixtures after adsorption. Evidence is adduced for the formation of $\text{C}_5\text{H}_5\text{N}_2\text{EtOH}$ at the interface. Vals. for n of $\text{C}_5\text{H}_5\text{N}$ -EtOH mixtures at 23-37° are recorded.
C. R. H.

Adsorption in the gaseous phase. P. DEMOUGIN (Mem. Poudres, 1937, 27, 57—71).—Theoretical.
W. J. W.

Surface compounds. R. JUZA and R. LANGHEIM (Naturwiss., 1937, 25, 522—523).—A study of magnetic properties throws light on the adsorption of gases by activated C. The paramagnetism of O_2 disappears when the gas is adsorbed on C at room temp. This can be explained by supposing that surface compounds of C and O are produced, which, like CO and CO_2 , would not be paramagnetic. The diamagnetism of C_6H_6 , Br, and I, respectively, adsorbed on activated C is < that calc. for the free mols. and C. If the susceptibility of the adsorbed substance is calc. on the assumption that the magnetism of C is the same before and after the adsorption, there is a decrease in the diamagnetic susceptibility

of C_6H_6 , and Br and I show a paramagnetic susceptibility instead of being diamagnetic. This may be due to the adsorption of the gases between the lattice planes of the graphite, thus diminishing the anomalous diamagnetism of C, or, more probably, to an alteration in the properties of the gases themselves owing to the special conditions obtaining at the surface.

A. J. M.

Properties of hydrogen films on tungsten by method of contact potentials. R. C. L. BOSWORTH (Proc. Camb. Phil. Soc., 1937, 33, 394—402).—The W-WH and W-WD contact potentials are -1.04 and -1.02 v., and the WH and WD work functions at 300° K, 5.60 and 5.58 v. At H is produced when a H_2 mol. strikes a bare W atom; one H atom is absorbed, the other goes into the gas phase. The condensation coeff. for H_2 mols. on cold W is 0.01 , and the dipole moment of the absorbed H atom is 0.42 D, independent of the proportion of surface covered.

F. J. L.

Passivity of metals. VIII. Rate of growth of oxide films on iron. H. A. MILEY and U. R. EVANS (J.C.S., 1937, 1295—1298; cf. this vol., 301).—Electrical measurements of the thickness of Fe oxide films produced by exposing Fe to dry air at 18 — 355° showed that even at room temp. the oxidation is very rapid. In general, the parabolic law connecting mean film thickness and time was not obeyed. It is probable that the film on Fe heat-tinted at temp. $>200^\circ$ is $\alpha\text{-Fe}_2O_3$; above 400° this is backed by Fe_3O_4 , and above 575° a third layer, chiefly of FeO , appears.

J. G. A. G.

Presence of films on metals. E. I. GUROYTSCHE (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 551—554).—A further proof of the existence of a film on metals has been obtained from photomicrographs of the effect of I vapour on a metal microsection before and after removing the surface layer mechanically under Hg; these show that the "denuded" surface is corroded to a much greater extent.

R. C. M.

Visible adsorbed films and the spreading of liquid drops at interfaces. D. H. BANGHAM, S. MOSALLAM, and Z. SAWERIS (Nature, 1937, 140, 237).—When a freshly split mica plate is placed under a jet of the supersaturated vapour of C_6H_6 , MeOH, or H_2O , condensation of bulk liquid occurs only after a film of crit. thickness has been formed. Under suitable conditions films of a thickness $<$ this, but thick enough to show interference colours, are produced. These adsorbed films have properties different from the bulk liquids. The behaviour of drops of different liquids, such as *n*-hexane and C_6H_6 , placed near to each other on a mica plate, is described.

L. S. T.

Structure of surface layers of liquids and films. S. E. BRESLER and P. F. POCHIL (Bull. Acad. Sci. U.R.S.S., 1937, 413—420).—The stability of the foam produced from fused *p*-azoxyanisole falls from the m.p. (118°) to zero at the transition point from anisotropic to isotropic liquid, at 137° . The η is at a min. at 130° , and at a max. at 140° , showing that the stability of the foam is not connected with η . The stability of the elementary foam obtained with polar liquids (AcOH, H_2O) is at a max. at

temp. $>0.1^\circ$ above their f.p. Dichroism is observed for H_2O at 0° , and disappears at 0.02° .

R. T.

Structure of protein monolayers. J. S. MIRCHELL (Trans. Faraday Soc., 1937, 33, 1129—1139).—The properties of unimol. films of wheat gliadin, zein, and insulin, prepared by spreading from solution, vary with the concn. of the protein solution and attain limiting vals. at a low concn. (0.01 — 0.001%). Homogeneous films of min. mean thickness 1.6 — 3.8 A. are formed by spreading from 0.01% solution and keeping for 1 to 36 hr. The gliadin films are almost identical with those obtained by spreading from the solid. The mechanical properties of the films are analysed in terms of mean properties per $CO\cdot NH\cdot CHR$ residue, and support the structure of protein films suggested by Hughes and Rideal (A., 1932, 909) with certain modifications, which are discussed. The separation of the polar and non-polar side-chains below and above the main chains, yielding a triplex structure in the high-pressure region, appears to justify the application of the results to biological problems.

J. W. S.

Protein films. E. GORTER (Trans. Faraday Soc., 1937, 33, 1125—1129).—The fact that the thickness of a unimol. film of protein (10 A.) is $<$ the radius of the globular protein mol. (22.5 A.) is attributed to an unfolding of the mol. with partial denaturation. The tendency of the protein to spread is increased by factors preventing ionisation of the NH_3^+ and CO_2^- groups, e.g., addition of electrolyte, bivalent acids, or amines. Experiments with artificial complex proteins suggest that the spreading properties of natural proteins depend on their composition. Thus proteins do not spread if their upper surfaces contain too many polar groups or their lower surfaces contain too few. The ion contents of plasma and muscular tissue show a rough parallelism with the concns. required to give a spreading tendency to proteins.

J. W. S.

Identification of opaque solids by selective iridescent filming. I. Optics. A. M. GAUDIN (J. Physical Chem., 1937, 41, 811—859).—Theoretical. An optical analysis of thin films between layers of dissimilar substances.

C. R. H.

Use of the word substrate. N. K. ADAM (Nature, 1937, 140, 158).—The word "substratum" or "underlying liquid (or solid)" should be used instead of substrate for the denser phase adjoining a surface film.

L. S. T.

Properties of detergent solutions. II. Surface and interfacial tensions of aqueous solutions of alkyl sodium sulphates. III. Influence of added electrolytes on the surface activity of the higher alkyl sodium sulphates. J. POWNEY and C. C. ADDISON (Trans. Faraday Soc., 1937, 33, 1243—1253, 1253—1260; cf. A., 1935, 1458).—II. The surface tensions (γ) of dil. aq. solutions of the compounds $C_nH_{2n+1}\cdot SO_4Na$ ($n = 12, 14, 16$, or 18) at various temp. and concns. have been determined by the ring method. Interfacial tensions against xylene (σ) have been determined by the drop-wt. method for the same salts at 60° and for $C_{12}H_{25}\cdot SO_4Na$ solutions over the range 20 — 75° . Both the γ - c and σ - c curves show breaks at a crit. val. of c (c_c) at which micellar

formation sets in. The temp. coeff. of c_0 is $<2.5\%$ per degree and is a max. for $n = 14$. The nature of the surface-active species, the equilibrium between simple long-chain ions and micelles, and the influence of chain length on the temp. coeff. of γ and σ are discussed. Various disturbing factors render application of the Gibbs equation inadvisable.

III. Added salts $[\text{NaCl}, \text{CaCl}_2, \text{Al}_2(\text{SO}_4)_3, (\text{NaPO}_3)_4]$ modify the surface activity and c_0 to an extent which depends on chain length, temp., and on the valency of the added cation, but is independent of the added anion. J. W. S.

Effect of amino-acids on the surface tensions of sodium chloride solutions. J. W. BELTON (Trans. Faraday Soc., 1937, 33, 1176—1180; cf. this vol., 234).—The surface tension (γ) of 0, 1, 2, 3, and 4N aq. NaCl, saturated with an NH_2 -acid (aspartic acid, asparagine, glutamic acid, *o*-, *m*-, and *p*- $\text{NH}_2\text{-C}_6\text{H}_4\text{-CO}_2\text{H}$), has been determined by the bubble-pressure method. The acids have little influence on γ in the case of H_2O , but this influence increases with increasing $[\text{NaCl}]$. The activities of the undissociated acids and their ions are approx. const. and it is inferred that the NH_2 -acid reduces the amount of H_2O adsorbed in the interface. The results are discussed from the viewpoint of the zwitterion theory. J. W. S.

Surface tension and thermodynamics. J. E. VERSCHAFFELT (Chem. Weekblad, 1937, 34, 570—573).—The views of Gibbs and van der Waals are discussed mathematically. S. C.

Molecular-theoretical treatment of surface tension. C. ZWIKKER (Chem. Weekblad, 1937, 34, 567—570).—A review. S. C.

Wetting and spreading properties of aqueous solutions. Mixtures of sodium hydroxide with *n*-hexoic, *n*-octoic, *n*-decoic, lauric, myristic, and palmitic acids. H. L. CUPPLES (Ind. Eng. Chem., 1937, 29, 924—926).—The surface tensions (γ), and interfacial tensions against petroleum (σ), of 1% solutions of fatty acids have been determined in presence of 0.5—3 mol. of NaOH per mol. of acid at 25—65°. Curves of γ , of σ and spreading coeff. (s) against NaOH content are similar in form, showing a min. val. of γ and σ below a mol. ratio of $\text{NaOH/acid} = 1.0$, and a sharp rise at approx. 1.0 followed by a gradual decrease. The increase in γ and σ in the region of the equivalence point rises with decreasing mol. wt., except for *n*-hexoic acid. Vals. of γ for the fatty acids are $>$ the vals. for the soap solutions containing excess of acid. The curves for s are similar to those for γ and σ , but the relations are inverse in character. Applications are discussed. R. S. B.

Kinetics of wetting and linear corrosion of metals in polyphase systems: metal-liquid-liquid and metal-liquid-gas. III. D. I. MURLIS (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 463—467; cf. this vol., 367).—The kinetics of wetting and the corrosion of Al in aq. $\text{HCl-C}_6\text{H}_6$, $\text{H}_2\text{O-C}_6\text{H}_6$, $\text{H}_2\text{O-air}$, and aq. HCl-air systems have been studied. For rough Al surfaces pitting corrosion occurs at the phase boundary, whilst for smooth surfaces corrosion

is uniform over the whole area of Al covered by the corroding liquid. O. D. S.

Dynamic activity of charcoal filters. N. A. IZMAILOV and K. K. SIGALOVSKAJA (Trav. Inst. Chim. Charkov, 1935, 1, 133—162).—The point of saturation of a layer of C by C_6H_6 , *n*-heptane, PhOH , C_{10}H_8 , or CS_2 vapours present in air which is passing through the layer has been observed by increase in the wt. of a small adsorbent tube through which the issuing air is passed. The $V/V_s - \log \bar{D}$ curves (V and V_s are the vols. occupied by the substance at the given pressure, and at the pressure of its saturated vapour, respectively, and \bar{D} is the average pore diameter) for the above substances (except CS_2) coincide, in agreement with Kubelka's theory (A., 1931, 1121). The thickness of the adsorbed layer in the capillaries at the moment when the adsorbate appears in the issuing gas is the same for all adsorbates studied. The concn. of substance in the gas filling the capillaries is only slightly $<$ that in the issuing gas. R. T.

Action of neutral salts on capillary activity of organic substances. T. M. POLONSKI (Trav. Inst. Chim. Charkov, 1936, 2, 105—155).—The surface tension of aq. PrCO_2H is raised by ions, in the order $\text{Cl} > \text{Br} > \text{NO}_3 > \text{CNS}$; $\text{Li} > \text{Na} > \text{K}$, $\text{Ca} > \text{Mg} = \text{Ba} > \text{Cu} > \text{Cd}$, to an extent inversely \propto salt concn. Szyszkowski's equation (cf. A., 1908, ii, 1018) is applicable to the systems, for salt concns. up to 4N. R. T.

Artificial membranes: their structure and permeability. K. H. MEYER (Trans. Faraday Soc., 1937, 33, 1073—1081; cf. A., 1936, 1065, 1335; this vol., 408).—The author's recent work on cation and anion permeability of synthetic membranes is summarised, and the results are compared with those obtained with natural animal and vegetable membranes. J. W. S.

Factors in membrane permeability. E. K. RIDGAL (Trans. Faraday Soc., 1937, 33, 1081—1085).—The formation of unimol. protein films of gel-like structure and the penetration of films by a polar compound in mol. equiv. proportions to form strong mixed films are discussed. It is suggested that substances which modify permeability of natural membranes may either produce or disperse bonds between protein groups directly or through sp. action on the foreign material present in the membrane. Thus substances with a narcotic action must have an active group of suitable sign to enable them to penetrate the gel system and must also possess a large hydrophobic portion so that the complex formed with one of the constituents of the membrane should be stable. Since there appears to be a definite amount of enzyme system per unit vol. of the membrane, substances which are strongly adsorbed will exert their narcotic action when a definite no. of mols. have penetrated unit vol. of the membrane. J. W. S.

Theory of membrane equilibrium. C. S. ADAIR (Trans. Faraday Soc., 1937, 33, 1106—1116).—Donnan and Guggenheim's criteria for equilibrium across a semipermeable membrane (A., 1933, 127; 1934, 840) are restated in terms of molarities and pressures. Terms not usually included in approx.

formulae may be important at high pressures or for membranes permeable to large mols. The calculation of the ratio of mean activity coeffs. of the ions of a salt is suggested as a criterion for equilibrium. The theory of membrane equilibrium and osmotic pressures in ideal systems with low osmotic pressure is discussed and applied to the process of dialysis.

J. W. S.

Activation energy of diffusion through natural and artificial membranes. J. F. DANIELLI (Trans. Faraday Soc., 1937, 33, 1139—1140).—Assuming a min. kinetic energy for penetration, formulae have been derived for the rate of penetration through a membrane and for its temp. coeff. The potential barrier of the membrane appears to be typical for a given type of cell of a given species. The difference between the activation energies for entering and leaving a cell may be very great (4000 g.-cal. for *Arbacia* eggs), indicating that the membrane can maintain concn. differences by utilising the heat energy of its surroundings.

J. W. S.

Statistical theory of perfect solutions. R. H. FOWLER and G. S. RUSHBROOKE (Trans. Faraday Soc., 1937, 33, 1272—1294).—Mathematical.

J. W. S.

Associating effect of the hydrogen atom. I. Amides and sulphonamides. H. O. CHAPLIN and L. HUNTER (J.C.S., 1937, 1114—1118).—Association factors for 9 amides and 33 sulphonamides have been calc. from cryoscopic data for solutions in C_6H_6 and $PhNO_2$. Mol. association is negligible when both amide-H atoms are substituted, but is generally present when there is one free amide-H and this is attributed to intermol. sharing of the H by resonance. The following have been prepared: *p*-toluenesulphonphenylbenzylamide, m.p. 139—140°, *N*-acetyl-*p*-toluenesulphonmethylamide, m.p. 58—59°, -anilide, m.p. 149—150°, -*o*-toluidide, m.p. 100°, -*m*-toluidide, m.p. 120°, -*p*-toluidide, m.p. 135°.

J. G. A. G.

Molecular state of liquids. K. L. WOLF, H. FRAHM, and H. HARMS (Z. physikal. Chem., 1937, B, 36, 237—287; cf. this vol., 138).—Measurements of orientation polarisation and heat of mixing indicate that in dil. solutions of alcohols in cyclohexane (I) and C_6H_{14} the mol. state of the solute is the same as in the gaseous state, but with increasing concn. there is association. In dil. solutions of EtOH in (I) the space-demand of the solute is $>$ in more conc. solutions owing to dissociation of associated mols. Even for conc. solutions of COMe, in such solvents the solute mols. seem to have more residual valency than associated alcohol mols. Lengthening of the hydrocarbon chain of an alcohol or branching near the OH opposes association. Solvation increases with the polarisability of the non-polar constituent of the solution. Solvation tends to reduce the space-demand. A convenient comparative measure of the dissociating power of the solvent is the concn. at which the heat of mixing ceases to vary with concn. In C_6H_6 the proportion of the double mols. of solute which are polar is $>$ in (I). There is evidence of approach to the formation of mol. compounds in CCl_4 -EtOH mixtures. The solvation of an alcohol with C_6H_6 is more sensitive to steric influences than

the association of alcohol mols. with each other. Heats of mixing and miscibility relations have been correlated. Owing to its association, EtOH mixed with a small amount of a non-polar liquid behaves in respect of heat of mixing and space-filling like a non-polar liquid. Viscosity measurements with (I)-EtOH mixtures show the break up of the associated EtOH mols. under the influence of (I) to be equiv. to a lubricating effect.

R. C.

Substituted quaternary azonium compounds.

V. Molecular state of phenyldimethylazonium, phenylmethylethylazonium, phenyldiethylazonium, phenylbenzylmethylazonium, and phenylbenzylpropylazonium iodides in dilute solution. B. K. SINGH and M. R. SUD (Proc. Indian Acad. Sci., 1937, A, 5, 522—527; cf. J.C.S., 1914, 105, 1751).—Mol. wt. determinations by the Lumsden-Walker method on dil. aq. and EtOH solutions are recorded. Except for the phenyldiethyl compound, the degree of association is lower in EtOH than in H_2O , contrary to the Nernst-Thomson rule. The degree of association in aq. solution decreases with increasing formula wt.; it decreases on dilution in both solvents.

A. J. E. W.

Compressions of solutions of salts in water, glycol, and methanol. R. E. GIBSON (J. Amer. Chem. Soc., 1937, 59, 1521—1528).—Sp. vols. of NaBr in MeOH and of CdI₂ in MeOH, H_2O , and $(CH_2OH)_2$, and compressions of NaI, LiI, NaBr, and CdI₂ in MeOH, NaI and CdI₂ in H_2O , and NaI, KI, CdI₂, LiBr, and NaBr in $(CH_2OH)_2$ have been determined and the apparent vols., compressions, and effective pressures computed. Significant differences between the behaviour of aq. and non-aq. solutions are discussed.

E. S. H.

Influence of solvents and other factors on the rotation of optically active compounds. XXXV. Attractive power and solvent effect on rotation. T. S. PATTERSON and G. M. HOLMES. XXXVI. **Asymmetric solvent action.** T. S. PATTERSON and A. H. LAMBERTON (J.C.S., 1937, 1403—1406, 1453—1459; cf. this vol., 279).—XXXV. The relative attractive powers of immiscible solvents for Et tartrate have been determined by experiments on the partition of Et tartrate between H_2O and an org. liquid (C_6H_6 , PhMe, and *p*-xylene, mesitylene, PhCl, PhBr, PhI, $PhNO_2$, *o*- $C_6H_4MeNO_2$, PhCHO, CCl_4 , $CHCl_3$, CH_2Cl_2 , EtBr, $C_2H_4Br_2$, $C_2H_4Cl_2$, $CHMeCl_2$, MeI, or EtI). Comparison of the vals. obtained with $[\alpha]_D$ does not reveal any general relation, but to some extent analogous solvents are grouped together.

XXXVI. A slight difference in the vols. of Bu^d *d*-tartrate and *l*-tartrate in *l*-menthyl acetate, and a similar difference in $PhNO_2$, has been observed. It appears that the vol. is the same in the two solvents.

E. S. H.

Application of Verdet's law to solutions. Magnetic rotatory power of ions. R. CORDONNIER (Compt. rend., 1937, 205, 313—315).—The differences shown by the mol. magnetic rotations of solutions of pairs of salts having the same two anions with a common cation are approx. const. F. J. G.

Raman scattering of silicate solutions. S. K. CHAKRAVARTI and P. B. GANGULI (J. Indian Chem. Soc., 1937, 14, 275—277).—The same shift ($\Delta\nu = 261 \text{ cm.}^{-1}$) is given by Na_2SiO_3 and by solutions in which the ratio $\text{Na}_2\text{O}:\text{SiO}_2$ is 1:2 and 1:4. The last gives pronounced general scattering. F. J. G.

Size of gas bubbles in liquids. R. SCHNURMANN (Kolloid-Z., 1937, 80, 148—151).—The size of macroscopic bubbles, produced by passing gas through a glass filter in $\text{EtOH-H}_2\text{O}$ mixtures, depends on the viscosity (η) of the liquid and not on the surface tension (cf. A., 1936, 1086). The bubbles are smallest for mixtures of max. η . E. S. H.

[Preparation of] colloidal solutions of silver and copper. H. FREUNDLICH and D. STEINER (J.C.S., 1937, 1081—1085).—Highly disperse Ag sols, free from org. substances and suitable for use as nuclear sols, were prepared by reducing ammoniacal Ag_2O solution with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in the presence of a trace of either Cu^{++} , Pb^{++} , or Zn^{++} . These metals also assist the formation of Ag mirrors, but as in sol formation, the favourable influence is limited to narrow ranges of concn. depending on the [Ag]. Complex cyanides and excess of NH_3 are disadvantageous. P in Et_2O , and PH_3 , produce very highly dispersed sols from the Ag_2O solution unassisted by Cu^{++} and unimpeded by excess of NH_3 .

Clear, amicrotic, red sols of negatively charged Cu metal, free from protecting colloids, were prepared by reducing boiling ammoniacal CuO solution with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ followed immediately by P in Et_2O . P, in the absence of $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$, did not yield the red sols, but, in sufficient quantity, afforded a brownish-black sol probably containing Cu phosphide. Coarser red sols were obtained from $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ and the CuO solution in absence of P, and mirror formation was favoured by an excess of NH_3 < the optimum for the highly disperse red sols. The mechanism of the formation of the sols is discussed. J. G. A. G.

Effectiveness of filtration, dialysis, electrolysis, and their intercombinations as purification processes. E. MANEGOLD (Trans. Faraday Soc., 1937, 33, 1088—1094; cf. this vol., 180).—A comparison of the times required for purification of a hydrosol from electrolyte contamination by various methods shows that electrolysis may contribute to purification when the concn. of electrolyte is low. When the smallest particles of hydrosol are relatively large (about $5 \times 10^{-4} \text{ cm.}$) purification is quickly attained by filtration, but when they are very small (e.g., $5 \times 10^{-8} \text{ cm.}$) dialysis gives quicker results than filtration unless high-pressure filtration is used. J. W. S.

Structure of highly-purified sulphide sols. II. Antimony trisulphide sol. W. PAULI, W. KOLBL, and A. LAUB (Kolloid-Z., 1937, 80, 175—185; cf. this vol., 237).—By electro-decantation of very dil. Sb_2S_3 sols, highly conc., pure sols have been prepared. The conductivity and titration curves of the sols, and their behaviour on coagulation by electrolytes, on freezing and boiling, and on oxidation have been investigated. In general, the results are analogous to those already reported for As_2S_3 sols. E. S. H.

Potential and transport measurements with ferric oxide hydrosols. II. A. LOTTERMOSER and H. FRITZSCHE (Kolloid-Z., 1937, 80, 166—174; cf. this vol., 460).—Apparatus and technique for determining the $[\text{Cl}^-]$ of $\text{Fe}(\text{OH})_3$ sols by measurement of transport nos. are described. Significant results can be obtained only with an aged sol, as in freshly-prepared sols the $[\text{Cl}^-]$ varies during the experiment. Results obtained for $\text{Fe}(\text{OH})_3$ sols agree with those obtained by measurement of potential. E. S. H.

Viscosimetric behaviour of sodium oleate solutions. W. PHILIPPOFF and K. HESS (Ber., 1937, 70, [B], 1808—1814).—Under suitable conditions Na oleate (I) solutions show a marked structural viscosity such as has been observed previously only with cellulose derivatives (II), caoutchouc, and synthetic polymerides. In dil. solution the η of (I) follows the same law as does that of (II). With increasing concn. the graph changes its direction more rapidly than is required by the law and finally becomes nearly asymptotic. In this last region the presence of cryst. micelles is detected Röntgenographically and it appears probable that the rapid increase of η with concn. is due to such micelle formation, which, however, occurs to some degree in considerably more dil. solution. These micelles appear remarkably stable to alteration in temp. Comparison is made of the properties of solutions of (I) with those of cellulose esters. H. W.

Röntgenographic investigations of resting and flowing colloidal solutions. Detection of the orientation of colloidal particles in flowing through capillaries by the occurrence of fibre diagrams. Hydration of colloidal particles in solution. K. HESS and J. GUNDERMANN (Ber., 1937, 70, [B], 1800—1808).—Röntgenographic investigation of flowing aq. sols of V_2O_5 , Hg sulphosalicylate (I), and Na oleate (II) shows that at comparatively low concn. the reflexion phenomena suffice to elucidate further the nature of the suspended particles in the solution. In confirmation of optical investigations, V_2O_5 and (I) are found to be extended stiff particles (rod colloids) of cryst. character, probably surrounded by H_2O mols. arranged in lattice formation. The particles of (II) appear to be leaflets composed of layers in which the oleate mols. are perpendicular to the basal plane. With increasing dilution the leaflets diminish in thickness and finally represent a bimol. layer of oleate chains arranged in pairs. The immediate investigation of sol solutions has the great advantage of excluding secondary changes during the separation of the disperse phase from the dispersing agent. Investigation in the flowing condition has the further advantage that it is possible to determine the form of the particles. If orientation effects occur during flow the method is preferable to working with the stationary condition since the increase of intensity which accompanies the opening of the original Debye-Scherrer rings to crescent or point reflexes permits direct observation at considerably lower concn. H. W.

Dispersion of depolarisation of light-scattering in colloids. IV. Iodine, graphite, stearic acid, vanadium pentoxide, arsenic trisulphide,

and ferric hydroxide sols. V. Colloidal dyes. R. S. KRISHNAN (Proc. Indian Acad. Sci., 1937, A, 5, 499—509, 551—563; cf. this vol., 182, 409, 460).—IV. Measurements of the depolarisation factors ρ_u , ρ_v , and ρ_h , and of the extinction coeffs. of the sols, in the λ range 2500—7000 Å., are recorded. In I sols the absorption and ρ_u are max. at 4500 Å.; the particles are spherical. In graphite sols ρ_u increases and ρ_v decreases with decreasing λ ; the particles are non-spherical and moderately anisotropic. Stearic acid, V_2O_5 , and $Fe(OH)_3$ sols show normal dispersion due to a particle size effect; the particles are non-spherical, those of V_2O_5 being rod-shaped and highly anisotropic. In As_2S_3 sols ρ_u , ρ_v , and ρ_h increase with λ , the particles being spherical and feebly anisotropic.

V. Similar measurements on ten dye sols show that the depolarisation reaches a max. at the absorption maxima. The condition of the dispersed particles is discussed.

A. J. E. W.

Adsorption of precipitates. I. Adsorption of precipitates of ferric, aluminium, and chromic hydroxides. N. A. YAJNIK, P. L. KAPUR, and R. L. MALHOTRA (Kolloid-Z., 1937, 80, 152—155).—Measurements of the adsorption of CN' , SCN' , NO_3' , IO_3' , BrO_3' , MnO_4' , CrO_4'' , C_2O_4'' , $Fe(CN)_6'''$, and $Fe(CN)_6'''$ by pptd. $Fe(OH)_3$, $Al(OH)_3$, and $Cr(OH)_3$ show that the order of adsorption does not depend only on valency, but is influenced by sp. chemical factors, such as the formation of insol. or complex salts.

E. S. H.

Thermo-ageing of colloids. II. Variation of the viscosity and opacity. S. S. JOSHI and G. SINGH (J. Indian Chem. Soc., 1937, 14, 254—259; cf. A., 1936, 935).—When colloids are "thermo-aged" by refluxing on a water-bath, it would seem that η generally decreases whilst the transparency increases; in some cases, however, these qualities increase or decrease together.

F. J. G.

Electrolyte coagulation of weakly solvated sols and electrolyte activity. VIII. Ion antagonism in flocculation. Wo. OSTWALD and K. HOFFMANN (Kolloid-Z., 1937, 80, 186—204; cf. this vol., 410).—The activity coeffs. of binary mixtures of electrolytes are discussed theoretically in the light of published work on ion antagonism. The conclusions reached support the view that the stability of a sol is more influenced by the physico-chemical state of the electrolytic dispersion medium than by that of the disperse particles and that coagulation is determined by interionic forces in the dispersion medium.

E. S. H.

Cryolysis of casein. F. F. NORD, H. LEICHTER, and G. UMBACH (Z. Elektrochem., 1937, 43, 682).—During freezing, casein solutions show the normal disaggregation-aggregation phenomena of a lyophilic colloid (A., 1935, 1276). Alkaline casein solutions of p_H 6.8—7.2 have a characteristic absorption band at about 2760 Å., which varies in intensity in the frozen and unfrozen states in accord with interferometric observations. The variation in mol. size of casein between 75,000 and 275,000 (A., 1930, 386, 488) supports the conclusion that the so-called "normal nos." of proteins, determined by ultracentrifugal methods, depend on the previous treat-

ment of the sample. The results explain why casein-containing provisions are less stable at room temp. after cooling, e.g., to -17° , since the change in degree of dispersion may facilitate attack by enzymes etc.

J. W. S.

Rigidity and constitution of a thermo-reversible gel. F. HIRATA (Proc. Imp. Acad. Tokyo, 1937, 13, 266—269).—The rigidity of a gelatin gel at its isoelectric point, and at temp. between 5° and 23° , has been studied by a modified Michaud method (cf. A., 1932, 122). The results indicate that the change in rigidity with temp. is due to variation of the electrostatic forces between the micelles, caused by changes in the dielectric const. of the intermicellar liquid.

A. J. E. W.

Heat of wetting of activated silica gel. D. T. EWING and G. T. BAUER (J. Amer. Chem. Soc., 1937, 59, 1548—1553).—The adsorption-desorption curves obtained for H_2O vapour on SiO_2 gel show no hysteresis. Heats of wetting have been determined for gels of different H_2O content; a max. has been found at 4% H_2O . SiO_2 gel is most highly activated by keeping it for many hr. in vac. at $260-275^\circ$.

E. S. H.

Emulsion practice with aqueous carbamide-protein solutions. A. STEIGMANN (Kolloid-Z., 1937, 80, 217—219).—Peptisable AgBr ppts., containing 6—8 times the amount of gelatin, can be prepared by dissolving the gelatin in conc. aq. $CO(NH_2)_2$ and then adding it to cold aq. HBr. The action of $CO(NH_2)_2$ on glutin is disaggregating rather than hydrolytic, and glutin can be made to crystallise rapidly from the solution by adding cold H_2O or slowly by adding hot H_2O .

E. S. H.

Deformation mechanism, swelling anisotropy, and fine structure of hydrous cellulose gels. P. H. HERMANS and A. J. DE LEEUW (Naturwiss., 1937, 25, 523—524).—A study of the anisotropy of swelling of threads of artificial cellulose enables the mean direction of the micelles to be determined. The swelling anisotropy (ratio of sp. transverse swelling to sp. longitudinal swelling) as a function of the extension has been measured for a cellulose xanthate thread. It is shown that the cellulose hydrate gels must have net-like structure. The threads are built up of micelles, for which the internal structure is cryst., whereas the external configuration is irregular, being bounded by numerous projecting, disordered cellobiose chains.

A. J. M.

Micellar structure and deformation processes of fibrous substances. IV. F. BREUER, O. KRATKY, and G. SAITO (Kolloid-Z., 1937, 80, 139—148; cf. A., 1935, 286).—Mainly theoretical. Experiments on the degree of swelling of cellulose acetate in dioxan- H_2O mixtures show that with low concns. of dioxan intermicellar swelling occurs, whilst swelling is intramicellar with high concns. of dioxan. The nature of these processes is discussed and the optical phenomena associated with intramicellar swelling are described, particularly with reference to the effect of deformation by stretching.

E. S. H.

Tension-optical coefficient as a material constant. A. V. BLOM (Kolloid-Z., 1937, 80, 212—

215).—The detection of strains in colloidal material, due to internal or external stresses, by means of double refraction is discussed. The determination of the tension-optical coeff. as a means of studying the mol. structure of polymerised substances is recommended. E. S. H.

Isoelectric point of fibroin of Chinese silk.—See A., III, 376.

Micellar structure of rubber. O. KRATKY and F. SCHOSSBERGER (Z. Elektrochem., 1937, 43, 666—667).—Films of readily sol. and of difficultly sol. rubber, deposited from very dil. solution in C_6H_6 , PhMe, CCl_4 , or $CHCl_3$, show a high degree of orientation. This is interpreted as indicating that the faculty for forming box-like micelles is directly associated with the principal-valency chain. J. W. S.

Equilibrium $Co + CO_2 = CoO + CO$. III. A. F. KAPUSTINSKI and E. HOFFMANN (Acta Physicochim. U.R.S.S., 1937, 6, 487—490).—Equilibrium data for this reaction at 720—1120° have been determined by the method previously described (A., 1936, 1464; this vol., 137). The heat of formation of CoO is 53,408 g.-cal. per mol., and the change in free energy at 25° is 11,400 g.-cal. per mol. J. W. S.

Calculation of equilibria in the gas phase from thermal data. O. FUCHS and K. RINN (Angew. Chem., 1937, 50, 708—712).—Heat changes in the hydrolysis of Ac_2O , $(EtCO)_2O$, HCO_2Me , and $MeOAc$ have been measured. Thermal data for 26 gases and vapours are tabulated and their application to the determination of equilibrium consts. in the gas phase is discussed, with special reference to the CO_2 -CO- H_2O - H_2 equilibrium. J. W. S.

Vapour-phase hydration of ethylene. M. P. APPLEBEY, J. V. S. GLASS, and G. F. HORSLEY (J.S.C.I., 1937, 56, 279—281r).—The equilibrium for the vapour-phase hydration of C_2H_4 to EtOH has been determined for five temp. ranging from 175° to 275° using cadmium metaphosphate prepared in accordance with B.P. 369,216 (B., 1932, 670) as catalyst. The results plotted logarithmically against $1/T$ lie on a straight line from which the heat of reaction is estimated to be 9900 g.-cal.

Variation of some technically important gas equilibria with temperature and pressure. H. ZEISE (Z. Elektrochem., 1937, 43, 704—708).—The vals. of $\log K_p$ and the degree of dissociation (α) have been calc. over wide limits of temp. and pressure and are presented in tabular form for the equilibria $H_2 \rightleftharpoons 2H$, $O_2 \rightleftharpoons 2O$, $H_2O \rightleftharpoons H_2 + \frac{1}{2}O_2$, $H_2O \rightleftharpoons H_2 + O$, $H_2O \rightleftharpoons \frac{1}{2}H_2 + OH$, $H_2O \rightleftharpoons H + OH$, and $CO_2 \rightleftharpoons CO + \frac{1}{2}O_2$. J. W. S.

Equilibria in protium oxide-deuterium oxide mixtures. W. H. HAMILL (J. Amer. Chem. Soc., 1937, 59, 1492—1494).—Published work on conductance and e.m.f. in H_2O - D_2O mixtures is explained in terms of the various isotopic equilibria, assuming the existence of H_3O^+ , H_2DO^+ , HD_2O^+ , and D_3O^+ . E. S. H.

Exchange equilibria of the hydrogen isotopes between water and molecules with numerous

atoms. K. WIRTZ (Z. Elektrochem., 1937, 43, 662).—Cf. this vol., 81. J. W. S.

Theory of binary liquid mixtures. A. MUSM (Z. Elektrochem., 1937, 43, 686—689; cf. this vol., 302).—The previous theory is extended into a general activity theory of binary non-electrolyte liquids. The consts. of the Duhem-Margules differential equation are taken as characteristic magnitudes for activity, and from them the energy of the mixture as well as heats of dissolution, mixture, and dilution can be calc. The results are in accord with experimental data for the heats of mixing of C_6H_6 and CCl_4 , $COMe_2$ and CS_2 , and $COMe_2$ and $CHCl_3$. J. W. S.

Structure in electrolytic solutions. P. DEBYE (J. Franklin Inst., 1937, 224, 135—144).—A résumé of the development of the interionic attraction theory. F. J. G.

Electrolyte action with acetic acid. I. Dissociation constant in aqueous ammonium and alkali chloride solutions. S. KILPI and A. MERETOJA (Z. physikal. Chem., 1937, 179, 371—392).—The dissociation const., K , has been determined by measuring the buffer capacity. When the acid concn., c , rises from 0.001 to 0.2N, K remains const. for a given salt concn., but in absence of a salt rises owing to the increase in ionic strength with c . For a given salt concn. K is smallest in KCl solution and is greatest in NH_4Cl and LiCl solutions. The mean thermodynamic dissociation const. at 20° is 1.754×10^{-5} . R. C.

Ortho-effect. II. Dissociation constants of o-substituted acids. J. F. J. DIRPY and R. H. LEWIS. III. Alkaline hydrolysis of benzoic esters. D. P. EVANS, J. J. GORDON, and H. B. WATSON (J.C.S., 1937, 1426—1429, 1430—1432; cf. A., II, 418).—II. Thermodynamic dissociation consts. have been determined for *o*-toluic, *o*-phenyl-, *o*-methoxy-, *o*-, *m*-, and *p*-phenoxy-, and *o*-nitrobenzoic, *o*-nitrophenylacetic (I), *o*- and *p*-chlorocinnamic acids. The recorded vals. ($\times 10^5$) are 12.3, 34.7, 8.06, 29.7, 11.2, 3.00, 671, 9.90, 5.83, 3.86. The greater strength of the *o*-isomerides of the benzoic series is discussed. The low val. for (I) is ascribed to a H linking between NO_2 and CH_2 .

III. The effect of a *m*-substituent on the alkaline hydrolysis of EtOBz is to change the energy of activation without influencing appreciably the val. of P in the kinetic equation $k = PZe^{-E/RT}$. An *o*-substituent is associated with a relatively low velocity of hydrolysis by decreasing the P factor. This may be due to a reduction of the facility with which the activated complex, formed by the ester and OH^- as the first step, breaks down to give the products. E. S. H.

Dissociation constants of organic acids. XVIII. Cyclic 1:1-diacetic acids. W. L. GERMAN and A. I. VOGEL (J.C.S., 1937, 1108—1112; cf. A., 1931, 1126; 1932, 572).—By means of potentiometric titrations with the quinhydrone electrode at 25°, classical and thermodynamical dissociation consts. have been determined. The thermodynamical vals., $K_1 \times 10^4$ and $K_2 \times 10^3$, for the following cyclic 1:1-diacetic acids are: cyclopentane-1,60, 17.0,

3-methylcyclopentane- 1-61, 18-2, cyclohexane- 3-27, 8-26, 2-methylcyclohexane- 2-96, 13-00, 3-methylcyclohexane- 3-23, 8-34, 4-methylcyclohexane- 3-23, 8-02. Intercarboxylic distances have been evaluated. The results support the view that the C rings in these compounds are strainless. J. G. A. G.

Dissociation constant of thyroglobulin.—See A., III, 403.

Causes of the colour change in cobaltous chloride solutions. H. DIRKING (Z. anorg. Chem., 1937, 233, 321—345).—Data relating to mol. wt., conductivity, transport, and absorption spectra have been obtained for solutions of CoCl_2 , CoBr_2 , and $\text{Co}(\text{SCN})_2$ in org. solvents, with or without the addition of other salts of the same anion. The results indicate that in presence of excess of the anion the Co is present entirely as complex anions, e.g., $[\text{CoCl}_4]^-$; otherwise there is equilibrium between, e.g., $[\text{CoCl}_2\text{S}_2]$, $[\text{CoS}_4]^-$ and $[\text{CoCl}_4]^-$ (S = solvent). The colour change is due to a change of co-ordination no. from 6 (red) to 4 (blue). F. J. G.

Hydrolysis of cobaltous chloride solutions. A. GOSSEY (Compt. rend., 1937, 205, 383—386).—Measurements of e.m.f. have been made with the quinhydrone electrode and a spongy Co electrode in 0.001—0.1M- CoCl_2 at 25°. J. G. A. G.

Hydrolysis of uranyl salts. B. SINGH and G. AHMAD (J. Chim. phys., 1937, 34, 351—354).—From e.m.f. measurements with the quinhydrone electrode at 30°, the degree of hydrolysis at corresponding dilutions is $\text{UO}_2(\text{NO}_3)_2 > \text{UO}_2\text{SO}_4 > \text{UO}_2(\text{OAc})_2$. J. G. A. G.

Heating curves of borates. I. N. S. KURNAKOV, A. V. NIKOLAEV, and A. G. TSCHELISCHTSHEVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 87—90).—The heating curves of synthetic and natural borates containing Na, K, Mg, and Ca have been studied. Endothermic arrest points, which all occur below 455°, are due to loss of H_2O . Exothermic regions of change are observed with all borates except with MgHBO_3 and $6\text{MgO} \cdot 8\text{B}_2\text{O}_3 \cdot \text{MgCl}_2$. The curves are sufficiently characteristic to be useful in analysis. R. S. B.

Specific heat and hardness of natural borates and their products of heating. II. N. S. KURNAKOV, A. V. NIKOLAEV, and A. G. TSCHELISCHTSHEVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 90—92; cf. preceding abstract).— d and hardness have been determined for naturally occurring borates, in the normal state, after removal of H_2O , and after the exothermic transformation. Removal of H_2O is usually accompanied by an increase in d . The contraction coeff. (observed d'/d for dehydrated borate calc. supposing no vol. change) is a max. for $2\text{CaO} \cdot 3\text{B}_2\text{O}_3 \cdot 13\text{H}_2\text{O}$ and $\text{Na}_2\text{O} \cdot 2\text{CaO} \cdot 5\text{B}_2\text{O}_3 \cdot 16\text{H}_2\text{O}$, and a min. for $8\text{CaO} \cdot 10\text{B}_2\text{O}_3 \cdot 15\text{H}_2\text{O}$ and $2\text{CaO} \cdot 3\text{B}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$, which contain zeolitic H_2O . The exothermic transformation is accompanied by a sharp rise in d and in hardness. R. S. B.

Hydration heat and exothermic borate transformation for inyoite $[2\text{CaO} \cdot 3\text{B}_2\text{O}_3 \cdot 13\text{H}_2\text{O}]$. Discussion of the transformation. N. S. KURNAKOV, A. V. NIKOLAEV, and A. G. TSCHELISCHTSHEVA

(Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 92—94; cf. preceding abstracts).—The heat of dissolution of inyoite and the products formed on heating have been determined in 25% H_2SO_4 . The heat of hydration is 42,700 and the heat of transformation 60,600 g.-cal. per mol. The high heat of transformation at 860—1080° causes spontaneous heating. X-Ray observations show that dehydration is accompanied by the formation of an amorphous phase, which becomes cryst. after further heating owing to the irreversible exothermic transformation. R. S. B.

New equilibrium diagram for the system Fe-C. I. ITAKA (Proc. Imp. Acad. Tokyo, 1937, 13, 277—279).—Anomalies in the "single" and "double" diagrams are discussed. The proposed new diagram contains stable equilibrium lines only, Fe_3C being assumed to decompose on solidification or on separation from austenite. A. J. E. W.

System water-sulphur trioxide. H. C. S. SNETHILAGE (Rec. trav. chim., 1937, 56, 891—897).—See this vol., 296. F. L. U.

System pyrogallol - *p* - phenylenediamine. M. G. J. BEETS (Rec. trav. chim., 1937, 56, 773—775).—The 1:1 compound has m.p. 120°, and the eutectics with 37.6 and 73.5 mol.-% of pyrogallol melt at 117.0° and 103.2°, respectively. F. L. U.

Rare-earth metals and their compounds. Thermal analysis of rare-earth nitrate mixtures. L. L. QUILL, R. F. ROBEX, and S. SEIFTER (Ind. Eng. Chem. [Anal.], 1937, 9, 389—392).—The liquidus curves of some binary systems of the simple and double nitrates of the Ce group have been determined. All the systems form a series of solid solutions with corresponding rare-earth and Bi salts. The use of the curves to determine the composition from f.-p. data is proposed. E. S. H.

Binary systems with palmitic acid. N. N. EFREMOV, A. D. VINOGRADOVA, and A. M. TICHOMIROVA (Bull. Acad. Sci. U.R.S.S., 1937, 443—466).—Solid solutions are formed in the systems palmitic acid (I)—myristic, —lauric, and —elaidic acid, —cholesterol, —phytosterol, and —camphor, but not in the systems (I)— $\text{C}_{10}\text{H}_{18}$, —oleic, —benzoic, and —salicylic acid. R. T.

Polythermals of the binary system HNO_3 -HCl and of the ternary system HNO_3 -HCl- H_2O . A. G. KOGAN and V. I. NIKOLAEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 103—106).—In the binary system well-defined max. occur corresponding with the compounds $3\text{HNO}_3 \cdot \text{HCl}$, $\text{HNO}_3 \cdot \text{HCl}$, and $2\text{HNO}_3 \cdot \text{HCl}$; with $\text{HNO}_3 \cdot 3\text{HCl}$ there is a latent max. The compounds are not stable above -50°, when the reaction $\text{HNO}_3 + 3\text{HCl} = \text{NOCl} + \text{Cl}_2 + 2\text{H}_2\text{O}$ occurs. In the ternary system the regions corresponding with the crystallisation of ice, $\text{HNO}_3 \cdot 3\text{H}_2\text{O}$, $\text{HNO}_3 \cdot \text{H}_2\text{O}$, HNO_3 , $3\text{HNO}_3 \cdot \text{HCl}$, $\text{HNO}_3 \cdot \text{HCl}$, $2\text{HNO}_3 \cdot 3\text{HCl}$, $\text{HCl} \cdot 3\text{H}_2\text{O}$, $\text{HCl} \cdot 2\text{H}_2\text{O}$, and $\text{HCl} \cdot \text{H}_2\text{O}$ have been studied. R. S. B.

System potassium chloride-potassium chlorate-water at 20°, 50°, and 75°. M. B. DONALD (J.C.S., 1937, 1325—1326).—The solution in equilibrium with both solids contains 25.0% of KCl and

1.56% of KClO_3 at 20° , 28.3% of KCl and 4.32% of KClO_3 at 50° , and 29.3% of KCl and 8.08% of KClO_3 at 75° .
J. G. A. G.

Polytherms of the ternary system $\text{MgSO}_4\text{--MgCl}_2\text{--H}_2\text{O}$. V. G. KUZNETZOV (Bull. Acad. Sci. U.R.S.S., 1937, 385—398).—Solubility data are given at 25° and 35° ; the solid phases separating are consecutively $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 6, 5, 4, and 1 H_2O , of which the most stable is the monohydrate, but the rate of transformation of the metastable hydrates is very slow. That of the 6- to the 5- or 4-hydrate is faster, but also requires a no. of days for completion with energetic stirring; under natural conditions this reaction is infinitely slow.
R. T.

System ammonia-selenic acid-water at 30° . G. B. KING (J. Physical Chem., 1937, 41, 797—801).—The solid phases obtained were $(\text{NH}_4)_2\text{SeO}_4$, $3(\text{NH}_4)_2\text{SeO}_4 \cdot \text{H}_2\text{SeO}_4$, and NH_4HSeO_4 .
C. R. H.

Displacement of platinum metals from solutions of their salts by hydrogen at high pressures. V. G. TRONEV (Bull. Acad. Sci. U.R.S.S., 1937, 333—362).—The reaction of pptn. of Pt metals from their salts by H_2 under pressure, with energetic stirring, is of the autocatalytic type, the displaced metals acting as catalysts. The reaction is represented: $\text{H}_2\text{MCl}_6 \rightleftharpoons \text{MCl}_6^{2-} + 2\text{H}^+$; $\text{MCl}_6^{2-} + 6\text{Cl}^- \rightleftharpoons \text{MCl}_4^{2-} + 2\text{H}^+$; $\text{MCl}_4^{2-} \rightleftharpoons \text{M}^{2+} + 4\text{Cl}^-$; $\text{M}^{2+} + \text{H}_2 \rightleftharpoons \text{M}^0 + 2\text{H}^+$ ($\text{M} = \text{Pt, Ir, Pd, Rh}$). Pt can be pptd. from a solution of H_2PtCl_6 and PdCl_2 in 6N-HCl by the action of H_2 at $25^\circ/30$ atm. (100 min.). Rh^{III} or Pd^{II} can similarly be separated from Ir^{IV} (1 hr. at $25^\circ/1$ atm.). Separation of Rh^{III} and Pd^{II} cannot be effected by this method, owing to the simultaneous pptn. of the metals.
R. T.

Heterogeneous equilibria with deuterium. J. R. PARTINGTON and R. P. TOWNDROW (Nature, 1937, 140, 156).—Vals. of K , obtained by a static method between 673° and 773° abs., in the reduction of CoCl_2 by H_2 and by D_2 , are recorded. The heats of reaction ($q_r - \Delta U$) deduced for the reactions $\text{CoCl}_2 + \text{H}_2 = 2\text{HCl} + \text{Co}$ and $\text{CoCl}_2 + \text{D}_2 = 2\text{DCl} + \text{Co}$ are $-31,850$ and $-30,790$ g.-cal. per mol., respectively, at a mean temp. of 450° . The heat of reaction deduced for $2\text{DCl} + \text{H}_2 = 2\text{HCl} + \text{D}_2$ is 1100 g.-cal. per mol.
L. S. T.

Physico-chemical equilibria in the carbonation of aqueous sodium sulphide at 25° . S. Z. MAKAROV and S. N. KRASNIKOV (Bull. Acad. Sci. U.R.S.S., 1937, 363—383).—Equilibrium data are recorded for the system $\text{Na}_2\text{S--CO}_2\text{--H}_2\text{O}$, at 25° . The only solid phases separating from unsaturated solution are NaHCO_3 and $\text{NaHCO}_3 \cdot \text{Na}_2\text{CO}_3 \cdot 2\text{H}_2\text{O}$. The process of carbonation of aq. Na_2S consists of the consecutive stages of absorption of CO_2 without and with evolution of H_2S , and, for the latter stage, without and with pptn. of carbonates. Carbonation is complete when the entire Na is present as NaHCO_3 .
R. T.

Partial pressure of ammonia, carbon dioxide, and water over ammoniacal sulphate and chloride solutions. A. P. BELOPOLSKI, S. J. SCHPUNT, and I. M. PALKINA (J. Chem. Ind. Russ., 1937,

14, 717—719).—V.-p. data are recorded for the systems $\text{Na}_2\text{SO}_4\text{--}$ and $\text{NaCl--NH}_3\text{--CO}_2\text{--H}_2\text{O}$, at $30\text{--}60^\circ$.
R. T.

Thermodynamic conditions and efficiencies of the coupling of chemical reactions. P. VAN RYSELBERGHE (J. Physical Chem., 1937, 41, 787—796).—A mathematical treatment of the principles of Burk (cf. A., 1931, 655) and others on the thermodynamics of coupled reactions in biological systems.
C. R. H.

Heats of dilution of some salts in D_2O and H_2O solutions at 25° . W. BIRNTHALER and E. LANGE (Z. Elektrochem., 1937, 43, 643—659; cf. A., 1936, 1340).—At very low concns. the heats of dilution of NaCl , KBr , KF , $\text{Ba}(\text{NO}_3)_2$, CuSO_4 , and BeSO_4 in D_2O are equal to those in H_2O . From this it is probable that the dielectric consts. of H_2O and D_2O have equal temp. coeffs. At higher concns. the heat of dilution becomes less positive or more negative on passing from H_2O to D_2O , the difference increasing regularly with increasing concn. At high concns. of KF the differential heat of dilution becomes approx. independent of concn.
J. W. S.

Heats of hydration and dissolution of anhydrous copper sulphate in light and heavy water. E. LANGE and H. SATTLER (Z. physikal. Chem., 1937, 179, 427—444).—The integral heats of dissolution of CuSO_4 in D_2O and H_2O and of its deuterates and hydrates in D_2O and H_2O , respectively, have been measured and used to calculate heats of hydration. For both D_2O and H_2O the heat of hydration for the first mol. is positive and approx. twice as great as for each of the other four mols. The binding force between H_2O and an ion is best represented by the "heat of adhesion," estimated either by deducting from the heat of formation of the hydrate the heat of vaporisation of H_2O and the energy required to expand the salt to accommodate the H_2O to be added, or by deducting from the first heat of dissolution the lattice energy of the anhyd. salt and the energy required to create space in the solvent for the solute ions (cf. A., 1936, 1340). Both methods of calculation indicate that the CuSO_4 ions bind D_2O more firmly than H_2O .
R. C.

Recalculation of heat effects. W. A. ROTH and A. BERTRAM (Z. physikal. Chem., 1937, 179, 445—449).—The following heats of formation have been calc.: (HCl) ($20\text{--}25^\circ$), $+21.89 \pm 0.03$; [HgCl], $+31.41$; (HI) (at 20° and const. vol.), -5.95 ± 0.04 ; (Cl_2O) (at 20° and const. vol.), -24.96 ± 0.06 ; (HBr) (at 18° and const. pressure), $+8.4_6$; [PbCl_2], $+85.5$; [PbI_2], $+42.9_1$ kg.-cal.
R. C.

Heat of decomposition of dichlorine heptoxide. C. F. GOODEVE and A. E. L. MARSH (J.C.S., 1937, 1161—1166).—By means of a novel thermochemical technique, gaseous Cl_2O_7 was decomposed directly into its elements by streaming over a red-hot Pt filament and the heat evolved was determined by absorption in a continuous-flow calorimeter. The val. of Δ for the reaction $\text{Cl}_2\text{O}_7 = \text{Cl}_2 + 3.5\text{O}_2$ is -63.4 ± 3 kg.-cal.
J. G. A. G.

Thermochemistry of complex compounds of aluminium. I. Compounds of aluminium

bromide with metallic bromides. V. A. PLOTNIKOV and S. I. JAKUBSON (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 3—14).—Heats of formation of AlBr_3 , MBr and 2AlBr_3 , MBr ($\text{M} = \text{Li}, \text{Na}, \text{K}, \text{Ag}$) have been determined. Vals. in kg.-cal. per g.-mol. are: 2AlBr_3 , LiBr , 4.9; AlBr_3 , LiBr , 7.9; 2AlBr_3 , NaBr , 7.0; AlBr_3 , NaBr , 10.1; 2AlBr_3 , KBr , 13.9; AlBr_3 , KBr , 16.0; 2AlBr_3 , AgBr , 6.9; AlBr_3 , AgBr 13.9. These lead to vals. for the decomp. potential in agreement with observation. The heat of dissolution of AlBr_3 (in 2993 mols. of H_2O at 15°) is 91.47 kg.-cal. per g.-mol. F. J. G.

Conductivity of potassium chloride solutions. C. W. DAVIES (J.C.S., 1937, 1326; cf. this vol., 244).—Solvent-corr. conductivities based on the Kohlrausch-Holborn 0.01N standard and on Kohlrausch and Maltby's standard are respectively 0.18% and 0.07—0.10% > those based on Jones and Bradshaw's standard. J. G. A. G.

Van der Waals forces in electrolyte solutions. J. LANGE and E. HERRE (Z. Elektrochem., 1937, 43, 592—595; cf. A., 1936, 1336).—From the f.p. and conductivity of 0.005—0.1N aq. solutions of KIO_3 , HIO_3 , KClO_3 , picric acid, Na picrate, and Na 2:4-dinitrophenoxide the osmotic coeff. (f_o) and conductivity coeff. (f_u) have been determined and expressed in the forms $1 - f_o = A_o\sqrt{c} + B_o c$ and $1 - f_u = A_u(\Lambda_o)\sqrt{c} + B_u c$. For ions showing no association $B_o = B_u = -0.6$, but when association occurs there are deviations ΔB_o and ΔB_u . When the association is between similarly charged ions $\Delta B_u = -\Delta B_o$, whereas when it is between oppositely charged ions $\Delta B_u = +2\Delta B_o$. The attraction between similarly charged ions indicates that the behaviour of strong electrolytes is attributable to quantum mechanical forces. J. W. S.

Theory of electrolytic phenomena in solid metals. K. SCHWARZ (Z. Elektrochem., 1937, 43, 585—587; cf. A., 1933, 571, 908).—The transport nos. of metals in their amalgams and in fused Pd-H , Fe-C , Pb-Au , Au-Pb , Au-Pd , and Au-Cu alloys are in accord with the vals. calc. from their diffusion consts. Ions with the greatest charge density move towards the cathode. The unexpected movement of Au towards the anode in Au-Pb alloys indicates that it is uncharged, in accord with other phenomena observed with this alloy. J. W. S.

Variations in the conductivity of dilute solutions of molybdic acid during neutralisation. (MME.) Z. SOUBAREW-CHATELAIN (Compt. rend., 1937, 205, 222—225).—Conductometric curves are given for titration of molybdic acid with NaOH , glyoxaline, and $(\text{CH}_2)_6\text{N}_4$, and of mannitolmolybdic acid with NaOH . Pronounced peaks are observed corresponding with two mols. of MoO_3 per equiv. of base. Discontinuities occur with one mol. of MoO_3 per two equivs. of base. NaHMo_2O_7 and $\text{Na}_2\text{Mo}_2\text{O}_7$ are probably formed during neutralisation, the ion $[\text{HMo}_2\text{O}_7]^-$ occurring in solution. A. J. E. W.

Surface conductivity on diaphragms. S. KOMAGATA and M. NISHIKAWA (Z. physikal. Chem., 1937,

179, 461—465).—Surface conductivities of aq. solutions of chlorides have been measured.

R. C.

Hittorf transference numbers of solutions of potassium, sodium, and lithium chlorides in water and in one-tenth molar hydrochloric acid. L. NICKELS and A. J. ALLMAND (J. Physical Chem., 1937, 41, 873—886).—The data for dil. neutral solutions at room temp. do not afford evidence for the high hydration vals. usually ascribed to alkali metal cations. In HCl solutions H^+ appears to carry less and the metallic cations more current than is expected from their relative mobilities in solutions of the corresponding single electrolyte. Errors arising from a slight change in composition of the middle layer in the LiCl-HCl mixtures are discussed.

C. R. H.

Potential of the $\text{Ag(s)}, \text{AgI(s)}, \text{I}'$ electrode. J. Y. CANN and A. C. TAYLOR (J. Amer. Chem. Soc., 1937, 59, 1484—1486).—E.m.f. measurements of the cell $\text{Ag(s)}, \text{AgCl(s)} | \text{aq. KCl(m)}, \text{aq. KI(m)} | \text{AgI(s)}, \text{Ag(s)}$ at 25° give the normal electrode potential of $\text{Ag(s)}, \text{AgI(s)}, \text{I}'$ as $E^\circ = +0.1510$ and $\Delta F^\circ = -3485$ g.-cal. E. S. H.

Potential difference between solid silver halides and aqueous solutions. B. P. NIKOLSKI and V. M. VDOVENKO (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 99—102).—Cells of the type $\text{Ag} | \text{AgX} | \text{solution Z} | \text{calomel electrode (I)}$, where $\text{X} = \text{Cl}$ or I , $\text{Y} = \text{KCl}, \text{KI}$, or AgNO_3 , and $\text{Z} = \text{AgNO}_3, \text{KCl}$, or KI , have been studied. K halide (if $\text{Z} = \text{AgNO}_3$) and AgNO_3 (if $\text{Z} = \text{KCl}$ or KI) were added gradually to Z . A chloridised or iodised Ag electrode was also immersed in Z . The e.m.f. of the cell $\text{Ag} | \text{AgX} | \text{solution Z}, \text{AgX (saturated)} | \text{Ag}$ was not 0, but amounted to 4—9 mv., possibly owing to a difference between the inner and outer surfaces of the membranes. The solubility products of AgCl and AgI are 1.3×10^{-10} and 1.2×10^{-16} at 18° . HgNO_3 , $\text{Pb(NO}_3)_2$, AuCl_3 , and LiCl (using AgCl membranes), and KBr (using AgI membranes) have no influence on the e.m.f. of the cell (I) when added to solution Z , but TlNO_3 gives a marked change, probably due to the formation of solid solutions of AgCl and TiCl . In general the results agree with Haber's theory. R. S. B.

Influence of certain gases on the potential of copper in solutions of copper sulphate and sulphuric acid. J. KAMECKI (Rocz. Chem., 1937, 17, 319—326).—The highest positive potentials are found for Cu in n-CuSO_4 , in absence of H_2SO_4 , and in a N_2 atm.; the vals. are lower in H_2 , and still lower in O_2 . In presence of n-CuSO_4 the vals. are practically const. for H_2SO_4 of 0—1N, whilst with 0.01N- and 0.1N- CuSO_4 they vary inversely with the $[\text{H}_2\text{SO}_4]$. R. T.

Electromotive behaviour of nickel in presence of hydrogen. B. FORESTI (Gazzetta, 1937, 67, 399—407).—Suitably prepared electrodes of brass covered with a deposit of active Ni behave, in the presence of H_2 , like Pt-black . At $p_{\text{H}_2} > 4.53$ such electrodes are equiv. to an ordinary H_2 electrode

and give potentials \propto the p_H of the liquid medium. With $p_H < 4.53$ the electrode potential is $<$ that of a H₂ electrode, and the difference increases with decreasing p_H and depends also on the presence of salts in the solution. The results are discussed.

O. J. W.

Potential measurements, with exclusion of the diffusion factor in formation of alloys. N. S. FORTUNATOV and V. I. MICHAÏLOVSKAJA (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 41—47).—The e.m.f. of the element $Al|AlBr_3-KBr|Cu$ at 525—545° varies according to the composition of the alloy formed at the Cu electrode. Diffusion effects are eliminated by the inclusion of an appropriate resistance in the outer circuit.

R. T.

Local current theory of metal potential. III. Potential establishment of various metals on solution in iodine-potassium iodide solutions. W. J. MULLER and E. LOW (Z. Elektrochem., 1937, 43, 561—569; cf. this vol., 139).—Potential measurements and rates of dissolution of various metals in I-KI solutions support Muller's theory of the influence of surface films on metal potentials.

J. W. S.

Normal Volta potential $\Delta\psi_0$ of the most important electrochemical two-phase systems, especially of metal-metal salt solution electrodes. O. KLEIN and E. LANGE (Z. Elektrochem., 1937, 43, 570—584).—Direct determinations of Volta potential are complicated by the difficulty of producing uncontaminated metal surfaces, but it can be deduced indirectly from e.m.f. data and photo-electrically determined vals. of the energies of evaporation of electrons from the metals. The vals. for a no. of metal-metal salt electrodes are calc. The significance of the data for the calculation of the energies of solvation of the ions is discussed.

J. W. S.

Diffusion potential. A. AIROLA (Suomen Kem., 1937, 10, B, 18).—Preliminary. Closer agreement between the observed and calc. vals. of the diffusion potential at the boundary 0.025N-HCl|0.001N-HCl is obtained by assuming a linear relation between mobility and concn. than when the mobility is assumed const.

F. L. U.

Thermodynamical treatment of diffusion potentials. J. J. HERMANS and L. J. OOSTERHOFF (Phil. Mag., 1937, [vii], 24, 304—312).—Theoretical. By means of an analogy between a cell with diffusion and a short-circuited cell, it is shown that the thermodynamic treatment and the kinetic theory yield the same result for ideal solutions. The extension of the treatment to non-ideal solutions is proved to be impossible.

C. R. H.

Decomposition potentials of metallic chlorides and bromides in $SnCl_2$ and $SnBr_2$ as solvents. V. A. IZBEKOV and E. M. SKOBETZ (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 85—98).—Low vals. found for the decomp. potentials of halides in solution in Sn^{II} halides are due to depolarisation at the anode by formation of $SnCl_4$ or $SnBr_4$. The orders found are: Sn, Co, Cu, Ni, Ag, Bi (in $SnCl_2$) and Sn, Cu, Ag, Co, Ni, Bi (in $SnBr_2$). The vals. for pure $SnCl_2$ and $SnBr_2$

agree with those calc. from the heat of formation when allowance is made for depolarisation.

F. J. G.

Decomposition potentials of fused salts. I.—III. R. C. KIRK (Res. Stud. State Coll. Washington, 1937, 5, 79—80; cf. A., 1936, 430, 1467).

H. J. E.

Decomposition potentials of fused halides and their binary systems with a common cation. V. A. IZBEKOV and N. G. TSCHOVNIK (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 71—83).—The decomp. potential of a halide is scarcely changed by the addition of another halide of the same metal. The decomp. potentials of halides of Sn and Sb, and to a smaller extent of Bi, are altered by the addition of $AlCl_3$ or $AlBr_3$. Mixtures of two halides of the same metal do not conduct if their components are non-conductors, but the systems AlX_3-SbX_3 and AlX_3-HgX_2 ($X = Cl, Br$) are conductors, although their components are not.

F. J. G.

Decomposition potentials of metallic chlorides in fused $AlCl_3$ and $AlCl_3-KCl$ as solvents. V. A. IZBEKOV and N. G. TSCHOVNIK (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 57—70).—The decomp. potentials of $CdCl_2$, $SnCl_2$, $ZnCl_2$, $AgCl$, $SbCl_3$, and $BiCl_3$ in fused $AlCl_3$ and in fused $AlCl_3-KCl$ have been determined. The order found in these two solvents is Al, Cd, Ag, Sb, Sn, Bi; in $AlBr_3$ Sn stands before Sb, the order being otherwise unchanged. The large difference in the vals. for $SnCl_2$ or $SnBr_2$ in different solvents is due to secondary reactions such as depolarisation by formation of $SnCl_4$ at the anode.

F. J. G.

Effect of ultrasonic waves on electrolytic deposition potentials of gases. G. SCHMID and L. EHRET (Z. Elektrochem., 1937, 43, 597—607; cf. this vol., 415).—Low-intensity ultrasonic waves have a slight polarising effect and higher intensities a strongly depolarising effect on cathodic liberation of H_2 . The polarising effect is dependent on the nature of the cathode metal and sets in slowly, but persists for some time after the vibration ceases. This is caused by surface changes in the metal and can be removed by abrasion. The depolarising action of ultrasonic waves is so great that in some cases H_2 is liberated at potentials $<$ the reversible equilibrium potential. With increasing wave intensity a sudden decrease in electrode potential is observed, the magnitude of which appears to be independent of the cathode metal and for 0.465N aq. Na_2SO_4 is about 0.800 v. With increasing c.d. the potential jump decreases and disappears at about 10 ma. per sq. cm. With intense radiation the H_2 liberation potential becomes independent of p_H . At Mg cathodes the potential is increased at high radiation intensities. Preliminary investigations indicate that similar steps occur in the anodic potentials for liberation of Cl_2 and O_2 , but in the latter case the effect is less marked.

J. W. S.

Normal elements and lead accumulator as almost ideal cells. E. LANGE and K. NAGEL (Z. Elektrochem., 1937, 43, 584—585).—The requirements of completely reversible cells are stated and discussed with reference to the standard Cd cell and the Pb accumulator.

J. W. S.

Nature of the electrolytic depolarisation effect with a high-frequency current. I. RANZI and R. RICAMO (*Nuovo Cim.*, 1937, **14**, 1—7).—The depolarisation effect produced at a small Pt wire electrode (cathode or anode) by superimposing a high-frequency a.c. during the d.c. electrolysis of 0.1N- H_2SO_4 is shown to be a purely thermal effect and is not due to an increase in the rate of diffusion of the polarising substance (cf. A., 1932, 915). The depolarisation is the same when the heating of the electrode is effected by means other than an a.c. O. J. W.

Influence of the composition of the electrolyte on the electrodeposition of iron. E. S. SARKISOV (*Bull. Acad. Sci. U.R.S.S.*, 1937, 421—433).—The rise in polarisation potential E with increasing c.d. during electrolysis of N- Fe^{II} solutions, at p_{H} 4.88 and 16°, is greatest in the case of FeCl_2 - CaCl_2 solutions, and then diminishes in the order $(\text{NH}_4)_2\text{SO}_4$ - FeSO_4 , FeSO_4 , FeCl_2 . At 70° the val. of E rises very little with increasing c.d., for all the systems, the order now being $\text{FeSO}_4 > \text{FeCl}_2 > (\text{NH}_4)_2\text{SO}_4$ - $\text{FeSO}_4 > \text{FeCl}_2$ - CaCl_2 . The vals. of E obtained in presence of Fe^{III} are when Fe^{II} alone is present. The structure of the deposits of Fe varies with change in the composition of the electrolyte. R. T.

Passivity of iron and steel in nitric acid solution. Y. YAMAMOTO (*Bull. Inst. Phys. Chem. Res. Japan*, 1937, **16**, 428—444).—The voltage required to make an Fe anode passive when immersed in HNO_3 is in general raised by addition of HCl, and lowered by addition of H_2SO_4 . F. J. L.

Hydrogen overvoltage at mercury and the ζ -potential. I. S. LEVINA and V. SARINSKI (*Acta Physicochim. U.R.S.S.*, 1937, **6**, 491—504; cf. A., 1936, 1467).—The H overvoltage (V) on a stirred Hg cathode has been determined for c.d. (I) = 10^{-8} — 10^{-3} amp. per sq. cm. at 22° in 0.001N, 0.01N, and 0.1N aq. HCl. V is independent of H^+ and over the range investigated $V = a + b \log I$, where a and b are consts. and at 22° $b = 0.119$, in accord with theory (A., 1930, 1376). J. W. S.

Overpotential of metals in presence of colloids. M. I. ZILBERTARB and M. A. RABINOVITSCH (*Trav. Inst. Chim. Charkov*, 1935, **1**, 87—98).—The overpotential observed in the electrolysis of 0.1N- or N- AgNO_3 (Ag, Au, or Pt electrodes) is increased in presence of colloids (gelatin, dextrin, gum arabic) in the electrolyte; the effect is inversely \propto c.d. R. T.

Interferometric observations of streaming anomalies at cathodes. H. J. ANTWEILER (*Z. Elektrochem.*, 1937, **43**, 596—597).—C.d.-p.d. curves obtained in electrolysis between a large, almost unpolarisable anode and a dropping Hg cathode show a sudden increase in c.d. at a definite p.d.; this falls to a normal val. on further raising the p.d. Interferometric observations of the cathode region indicate that the abnormality is due to a stirring effect. When the deposition potential of the cation (V_{M}) is more positive than the electrocapillary zero potential of the Hg (V_{H_2}) (as with Hg_2^{++} , Cu^{++} , or Fe^{++}) streaks are observed which, although of material

lighter than the solution, fall away from the tip of the capillary. If V_{M} is more negative than V_{H_2} (Ni^{++} or Mn^{++}) only a whirling of the diffusion film is observed. The phenomena are the more marked the lower is the conductivity of the solution relative to the cation concn. J. W. S.

Spray electrification. S. CHAPMAN (*Physical Rev.*, 1936, [ii], **49**, 206).—The mobility spectrum of spray-electrified salt solutions has been investigated. Data relative to dil. solutions of LiCl, KCl, and NaCl are recorded. L. S. T.

Mechanism of chemical reactions. R. AUDUBERT (*Chem. Listy*, 1937, **31**, 277—281).—A lecture. R. T.

Theory of L_p . IV. L_p and the direction of chemical processes. N. A. TANANAIEV (*J. Appl. Chem. Russ.*, 1937, **10**, 1102—1111).—Theoretical. R. T.

Hydrogenation of nickel carbonyl. E. E. LITKENHOUS and C. A. MANN (*Ind. Eng. Chem.*, 1937, **29**, 934—938).—The reaction between $\text{Ni}(\text{CO})_4$ and H_2 (1 : 4) has been studied at 25—400° and at 1—75 atm. At 1 atm. it decomposes completely at approx. 100° and at >200° reaction begins with the formation of H_2O , CH_4 , and CO_2 . The % of H_2O = 58—60 vol.-% of the exit gas at 250°, and decreases with fall of temp. The % of CH_4 and CO_2 increases to a max. at 300—350° and then decreases. At 5 atm. decomp. is complete at approx. 200°. The ratio CO_2 : CH_4 is < at 1 atm. At 10—75 atm. $\text{Ni}(\text{CO})_4$ is increasingly stable. The yield of H_2O is a max. at 250—300° for all cases. With max. CH_4 and CO_2 the unchanged CO and H_2 are a min. The amount of unaltered C decreases with rise in temp. The reaction depends on the formation of H_2O and its subsequent reaction thus : $2\text{C} + 2\text{H}_2\text{O} = \text{CO}_2 + \text{CH}_4$, for which the equilibrium const. (K) is const. over the entire reaction range, in contrast to other possible reactions, which give const. vals. of K only at 300—400°. R. S. B.

Equilibria and kinetics of ammonia synthesis at ultra-high pressures.—See B., 1937, 902.

Reaction of sulphur dioxide and oxides of nitrogen under conditions of intense mixing. I. N. KUZMINICH, E. I. SURKOV, V. I. JUDINA, and E. A. ANDREEVA (*J. Appl. Chem. Russ.*, 1937, **10**, 1020—1031).—The velocity of reaction in a baffle tube between SO_2 - N_2 - O_2 mixtures and N_2O_3 in $\text{H}_2\text{SO}_4 \propto$ (i) $[\text{N}_2\text{O}_3]$ of the H_2SO_4 , (ii) the $[\text{SO}_2]$ and $[\text{O}_2]$ of the gas mixture, (iii) the height of the column of acid, and (iv) the temp.; it is inversely \propto the $[\text{H}_2\text{SO}_4]$. R. T.

Properties of nitrogen oxides. VI. Flame propagation in the system nitric anhydride-ozone. (The late) T. M. LOWRY and R. V. SEDDON (*J.C.S.*, 1937, 1461—1468; cf. A., 1936, 281).—The speed of travel of flame in a 90-cm. column of N_2O_5 - O_3 - O_2 at const. temp. has been measured. The influence of $[\text{N}_2\text{O}_5]$, $[\text{O}_3]$, age of the mixture, temp., total pressure, diameter and position of the reaction tube, and nature and concn. of the inert gas has been determined. The flame is propagated by the diffusion of "hot" mols. from the flame front into

the unburnt gas, causing activation and further reaction. E. S. H.

Combustion of aromatic and alicyclic hydrocarbons. I. Slow combustion of benzene, toluene, ethylbenzene, *n*-propylbenzene, *n*-butylbenzene, *o*-xylene, *m*-xylene, *p*-xylene, and mesitylene. J. H. BURGOYNE (Proc. Roy. Soc., 1937, A, 161, 48—67).—Correlation of pressure change with the course of the reaction shows that the rate of slow combustion can be measured by manometric observations. The influence of temp., concn., dilution by N_2 , and surface factors is studied. C_6H_6 differs from its derivatives in exhibiting evidence of chain mechanisms. Comparison of energies of activation establishes three classes: (1) C_6H_6 and derivatives with a single side-chain, (2) isomeric xylenes, (3) hydrocarbons with symmetrical mols. The reaction mechanisms are based on a different classification: (1) C_6H_6 , (2) derivatives with Me groups attached to the nucleus, (3) derivatives with a single side-chain containing > one C. G. D. P.

Inflammation of acetaldehyde. J. BARON and P. LAFFITTE (Compt. rend., 1937, 205, 52—54).—Ternary mixtures of $MeCHO$ and O_2 with N_2 , A, or CO_2 have been investigated. The addition of N_2 to a given $MeCHO-O_2$ mixture lowers the inflammation temp. The effect of CO_2 or A in place of N_2 is similar, but is more pronounced in the case of A. If the partial pressure of N_2 is kept const., an increase in the ratio partial pressure of $MeCHO$ /partial pressure of O_2 lowers and finally raises slightly the inflammation temp. C. R. H.

Limits and velocity of formation of pyromucanilide.—See A., II, 403.

Kinetics of thermal polymerisation reactions. J. W. BREITENBACH and W. JORDE (Z. Elektrochem., 1937, 43, 609; cf. this vol., 249, 366, 367, 416).—Formation of highly polymerised compounds is best explained as a chain reaction. The mean chain length in polymerisation of styrene in the liquid phase is independent of the area of the containing vessel. The reaction occurs more rapidly in air than in N_2 or high vac. J. W. S.

Highly-polymerised compounds. CLVIII. Kinetics of chain polymerisation. II. Thermal polymerisation of styrene out of contact with oxygen, and chain-breaking process. G. V. SCHULZ and E. HUSEMANN (Z. physikal. Chem., 1937, B, 36, 184—194).—In a N_2 atm. the polymerisation of styrene at 100° and 132° follows the unimol. law up to a conversion of 90%, and the degree of polymerisation, P , remains more nearly const. during the reaction than in the polymerisation in air. Atm. O_2 accelerates the reaction at the start and retards it later, but does not materially affect the chain length of the branching of the mols. Experiments on the polymerisation in $PhMe$ show that, as the theory of the chain-breaking process previously advanced (this vol., 86) would require, the val. of P/\sqrt{c} (c = concn. of the monomeric mols.) is approx. const. at a given temp. Dilution with highly polymerised polystyrene does not affect P . R. C.

Reaction kinetics of chain polymerisations. H. DOSTAL (Monatsh., 1937, 70, 409—419).—A theoretical treatment of the rate of polymerisation as a function of nucleus formation, chain growth, stabilising processes, and steric factors. H. J. E.

Thermal decomposition of azomethane. E. W. RIBLETT and L. C. RUBIN (J. Amer. Chem. Soc., 1937, 59, 1537—1540).—Velocity coeffs. calc. from the amount of Me_2N_2 decomposed at 340° are about 50% > those calc. by following the pressure change. The decomp. is complex; the products are N_2 , CH_4 , C_2H_6 , and a compound of higher mol. wt. containing N. In spite of the complexity, the decomp. at 340° is apparently unimol. E. S. H.

Mechanism of homogeneous thermal decomposition of gaseous acetaldehyde. M. LETORT (J. Chim. phys., 1937, 34, 355—385; cf. this vol., 416).—The hypothesis that the reaction proceeds by way of several independent quasi-unimol. decomp. (cf. A., 1933, 910) is criticised and is shown to be in disagreement with some of the data. A reaction mechanism involving free radicals is advanced whereby all of the existing data are interpreted. J. G. A. G.

Formation and decomposition of polyoxymethylene.—See A., II, 399.

Formation of anilides of acids. B. Z. AMITIN, N. V. ZAGORIANSKAJA, and N. A. POGORELSKAJA (Trav. Inst. Chim. Charkov, 1936, 2, 33—40).—The velocity of the reaction $NH_2R + R'CO_2H \rightarrow R'CO-NHR + H_2O$ at 100°, 155°, and 212° rises in the order $R = o\text{-tolyl} < Ph < p\text{-tolyl}$, and $R' = Pr^a < Et < Me$; $Ph < Pr^b < Pr^a$. The velocity of the reaction rises with rise of temp., but the equilibrium point is shifted to the left. R. T.

Steric factor in reactions in solutions. W. BRENSCHEDE (Z. physikal. Chem., 1937, 179, 457—460).—Polemical against Hückel (this vol., 86). R. C.

Influence of the solvent on the course of chemical reactions. XIII. Heat of dissolution and energy of activation in reactions of which one component serves as solvent. K. LAUER and R. ODA (Ber., 1937, 70, [B], 1707—1709).—Experiments on the sulphonation of 1:9-benzanthrone confirm the view that the energy of activation of a reaction in solution cannot be regarded as identical with the theoretical energy of activation of the change in the gas phase. If the solvent participates in the change it is possible to determine the true energy of activation of the change by determining the heat of dissolution of all the participants and addition of the heats of dissolution of the products and subtraction of those of the initial materials from the experimentally determined energy of activation; this is const. for all concns. for any defined reaction and is equal to the energy of activation in the gas phase. H. W.

Kinetics of thermal decomposition of oxalic acid in solution. A. DINGLINGER and E. SCHROER (Z. physikal. Chem., 1937, 179, 401—426).—The decomp. in aq. solution at 100—170° follows the unimol. law. The products are CO_2 , CO , and HCO_2H and the ratio of HCO_2H formed to $H_2C_2O_4$ decomposed

does not vary with temp., suggesting the mechanism $\text{H}_2\text{C}_2\text{O}_4 = \text{CO}_2 + \text{HCO}_2\text{H}$, $\text{H}_2\text{C}_2\text{O}_4 = \text{CO}_2 + \text{CO} + \text{H}_2\text{O}$. It is only the undissociated mols. which decompose. The energy of activation is high but falls with rising temp. and approaches the val. for the decomp. in dioxan or H_2SO_4 solution, presumably due to desolvation. There is no primary salt effect, but K_2SO_4 and $\text{K}_2\text{C}_2\text{O}_4$ retard the reaction owing to formation of KHC_2O_4 . HCO_2H has no effect. For each $\text{H}_2\text{C}_2\text{O}_4$ mol. activated at least three decompose, suggesting that rupture of the C-C linking yields radicals. The decomp. of $\text{H}_2\text{C}_2\text{O}_4$ in dioxan solution at 120–150° follows the unimol. law and the velocity coeff. is given by $7.6 \times 10^{11} e^{-29,450/RT}$. The energies of activation of monosubstituted malonic acids are < those of the disubstituted acids. R. C.

Kinetics of thermal polymerisation of dissolved styrene. H. SUESS, K. PILCH, and H. RUDORFER (Z. physikal. Chem., 1937, 179, 361–370; cf. this vol., 416).—The gross reaction velocity, k , in PhMe, PhCl, and dil. CCl_4 solutions at 80–120° follows the bimol. law. For the first two solutions k is almost the same as for pure styrene, but for CCl_4 solutions it is much smaller. The mean degree of polymerisation, P , of the product is related to the styrene concn., c , by $P = Ac/(Bc + D)$, where the const. B is negative for CCl_4 . These results may be explained by supposing that there is equilibrium between the reactive form of double linking in the growing chains and the inactive form in mono- and poly-styrene and that the position of equilibrium, which determines k , is largely independent of diluents, whilst the rate at which equilibrium is established, which determines P , is considerably influenced by added substances. R. C.

Velocity of hydrolysis of formaldehyde acetals.—See A., II, 399.

Rate of hydration of *trans*-crotonaldehyde.—See A., II, 399.

Heterogeneous combustion of mixtures of carbon monoxide, hydrogen, and oxygen on a vitreous surface. M. PRETTE (Compt. rend., 1937, 204, 1734–1736).—A very small addition of H_2 to a mixture of CO and O_2 greatly increases the speed of oxidation on vitreous surfaces at 500–600°, but for higher $[\text{H}_2]$ the speed is a linear function of the quantity of combustible not yet oxidised. For the majority of mixtures of CO, O_2 , and H_2 the speed of combustion is independent of the pressure of CO and O_2 , and varies only with the initial pressure of H_2 , as for the combination of O_2 and H_2 . It follows that of the reactions $\text{H}_2 + 0.5\text{O}_2 = \text{H}_2\text{O}$; $\text{H}_2\text{O} + \text{CO} = \text{CO}_2 + \text{H}_2$, the second is faster than the first, which controls the rate of oxidation. Mixtures of CO, O_2 , and H_2 oxidise at the same speed as corresponding mixtures in which H_2O vapour is replaced by an equal vol. of H_2 . R. S. B.

Velocity coefficient of dissolution of silica and glassy substances. S. K. TSCHIRKOV (J. Chem. Ind. Russ., 1937, 14, 845–846).—An expression for the velocity coeff. of the reaction between SiO_2 and NaCl is derived. R. T.

Stathmographic and kinetic investigation of the thermal decomposition of limestone. J. ŠPLÍČAL, S. SKRAMOVSKY, and J. GOLL (Coll. Czech. Chem. Comm., 1937, 9, 302–314).—The loss in wt. of finely ground calcite (I) in a vertical furnace at 680–830° was recorded automatically and continuously (cf. A., 1932, 1227). The rate of decomp. decreases as the thickness of the layer of (I) is increased and, for equal wts. of (I), as the grain size is increased. By extrapolation, decomp. in the atm. commences at 653°, and the 700–830° temp. coeff. leads to the heat of activation 37,300 g.-cal., which is close to the heat of decomp. An “incubation period” precedes the decomp., which is of the $\frac{1}{2}$ order with respect to CO_2 in the sample and is interpreted as the evaporation of CO_2 from the sample. J. G. A. G.

Rate of oxidation of metals at elevated temperatures.—See B., 1937, 923.

Transformation kinetics of austenite.—See B., 1937, 920.

Dissociation of peroxides and the cold flame of hydrocarbons. M. NEUMANN and P. TOUTAKIN (Compt. rend., 1937, 205, 278–280).—The crit. pressures at which Et_2O_2 induces the formation of “cold flames” in C_4H_{10} . O_2 are equal to those for spontaneous explosion of Et_2O_2 . Et_2O_2 diminishes the induction period for the appearance of the “cold flame” in $\text{C}_5\text{H}_{12} + \text{O}_2$. F. J. G.

“Catalytically polar” materials. H. SCHMID (Z. Elektrochem., 1937, 43, 626–629; cf. A., 1937, II, 188).—Whereas increase of the $[\text{H}_2\text{SO}_4]$ decreases the reaction velocity (v) in diazotisation processes, addition of HBr increases it. Addition of HCl causes first a decrease in v and then an increase in v with increasing $[\text{HCl}]$. It is concluded that H^+ is the negative and Cl^- the positive catalyst. The result is in accord with the author’s mechanism of the diazotisation process. J. W. S.

Decomposition of hydrogen peroxide in presence of a cobaltictric complex as catalyst. M. BOBTILSKY and (MLLE.) M. RAPPOPORT (Compt. rend., 1937, 205, 234–236).—In presence of H_2O_2 , a mixture of aq. solutions of CoCl_2 and Na citrate (in excess) gives a green complex containing a cobaltictric anion, which catalyses the decomp. of H_2O_2 . The best conditions for the catalysis have been investigated, and a mechanism is proposed. A. J. E. W.

Thermal transformations of potassium and sodium formate in presence of alkali hydroxides. L. C. FREIDLIN and A. I. LEBEDEVVA (J. Appl. Chem. Russ., 1937, 10, 1086–1094).— HCO_2M may react in presence of MOH as follows: (1) $2\text{HCO}_2\text{M} \rightarrow \text{M}_2\text{C}_2\text{O}_4 + \text{H}_2$; (2) $\text{HCO}_2\text{M} + \text{MOH} \rightarrow \text{M}_2\text{CO}_3 + \text{H}_2$; (3) $\text{M}_2\text{C}_2\text{O}_4 + 2\text{MOH} \rightarrow 2\text{M}_2\text{CO}_3 + \text{H}_2$. Reaction (1) does not take place in presence of 3–4 equivs. of MOH, when reactions (2) and (3) commence at 210° when $\text{M} = \text{Na}$, and at 270° when $\text{M} = \text{K}$. In presence of <0.1 equiv. of MOH reaction (1) is realised at 330–350° ($\text{M} = \text{Na}$), and at 410–430° ($\text{M} = \text{K}$). $\text{Na}_2\text{C}_2\text{O}_4$ is thus obtained in 94% yield. R. T.

Heats of activation in the mutarotation of glucose. II. Catalysis by water, acids, and bases. G. F. SMITH and (in part) M. C. SMITH (J.C.S., 1937, 1413—1420; cf. this vol., 89).—Catalytic coeffs. and heats of activation have been determined. Slight deviations from the Arrhenius equation exist for the reaction catalysed by H_2O , but not by acids or bases. The results are considered from the viewpoint of the kinetic equation $k = PZe^{-E/RT}$. The heats of activation sp. to the various catalysts differ only slightly and variations in k are due mainly to changes in P . P ranges from 10^{-4} for H_2O catalysis to nearly 10^4 for OH^- catalysis, and for acid and base catalysis can be correlated with the corresponding dissociation consts. by a relation of the form $P \sim \text{const.} \times K^n$, where n is const. for a series of catalysts. The validity of the assumptions made in computing P is questioned, as vals. of P 1 have been obtained. E. S. H.

Kinetic study of the ammonolysis of phenyl-acetic esters in methanol solution. R. L. BETTS and L. P. HAMMETT (J. Amer. Chem. Soc., 1937, 59, 1568—1572).—The rates of reaction of $CH_2Ph \cdot CO_2Me$ and its p -Cl- and p - NO_2 -derivatives with NH_3 in MeOH have been determined at 25° . The reaction deviates considerably from the second-order course, is retarded strongly by NH_4Cl , and accelerated markedly by NaOMe. The quant. data indicate an uncatalysed reaction of ester with NH_3 and a parallel base-catalysed reaction, possibly of ester with amide ion. Linear relations exist between the logarithms of the rates of both catalysed and uncatalysed reactions and the rates of hydrolysis of the same esters. E. S. H.

Role of redox potentials in inhibitor action. K. WEBER (Z. Elektrochem., 1937, 43, 633—636; cf. A., 1935, 588).—In the extinction of fluorescence of quinine sulphate and aesculin and retardation of the fading of thionine by alkali halides, and the deactivation of $H_2C_2O_4$ by dyes and quinine, the log of the half val. concns. changes linearly with the redox potential. Such inhibitor action is due to deactivation of the active carrier of the reaction. J. W. S.

Inhibition of the velocity of dissolution of aluminium in hydrochloric acid by pyridine derivatives. E. JENCKEL and F. WOLTMANN (Z. anorg. Chem., 1937, 233, 236—256).—The "poisoning" effects of a number of org. bases on the rate of dissolution of Al in $3N$ -HCl have been studied and correlated with their constitutions, their effects on the cathodic polarisation current, and with d and the rate of dissolution of their hydrochlorides. There is a rough parallelism between these three properties and the poisoning effect, and this is in agreement with the view that the effect is due to electrolytic pptn. of the hydrochloride on local cathodic areas. Some additional observations in support of this view are described. F. J. G.

Reactions in concentrated sulphuric acid. X. Molecular oxidation velocities. J. MILBAUER (Chem. Obzor. 1937, 12, 57—60).—By passing C_2H_2 , C_2H_4 , H_2 , CS_2 , COS, and CO through H_2SO_4 at 237° without a catalyst, SO_2 was liberated in

amounts diminishing in this order. There is no action with CCl_4 below this temp., and the result of the action with $CHCl_3$ can be expressed: $H_2SO_4 + CHCl_3 \rightarrow SO_2 + CO_2 + 3HCl$. This action is not affected by Pd, which accelerates the oxidation by H_2SO_4 of PH_3 to H_3PO_4 , HCN and C_2N_2 to NH_3 , and $MeSH$ to S. SeO_2 accelerates the H_2SO_4 oxidation of C, and $HgSO_4$ that of Fe, whilst both these reagents accelerate the action with S, P, Ag, and Sn. The oxidation of As, Sb, Bi, Hg, Fe, Ni, Co, and Cu was retarded by SeO_2 . The rate of oxidation of metals with H_2SO_4 alone decreases in the order: Sn, Hg, Co, Fe, Ni, Cu, Al, Ag, Zn, and Cd. F. R.

Effect of small amounts of iron, cobalt, and nickel etc. on the behaviour of zinc towards sulphuric acid.—See B., 1937, 923.

Catalysis in the manufacture of sulphuric acid.—See B., 1937, 901.

Contact oxidation of sulphur dioxide to sulphur trioxide under pressure.—See B., 1937, 906.

Ferromolybdenum catalysts of ammonia synthesis.—See B., 1937, 901.

Iron catalysts for ammonia synthesis.—See B., 1937, 902.

Platinum-rhodium and platinum catalysts for oxidation of ammonia.—See B., 1937, 902.

Characteristics of a copper catalyst activated by magnesium oxide. H. S. TAYLOR and G. G. JORIS (Bull. Soc. chim. Belg., 1937, 46, 241—252).—The catalyst, prepared by reducing washed and dried co-pptd. $Cu(OH)_2$ and $Mg(OH)_2$ in H_2 , retains its activity after being heated at 560° . The rate of hydrogenation of C_2H_4 at 0 — 40° is $-dp/dt = k[H_2]/[C_2H_4]$ approx. The temp. coeff. leads to the apparent energy of activation 7.3 kg.-cal. per mol. The hydrogenation of C_6H_6 reaches a max. at approx. 225° and is retarded by C_6H_6 . The reaction $C_2H_6 + H_2 \rightarrow CH_4$ at 380 — 470° in presence of excess of H_2 is slow; with low $[H_2]$, C is deposited and the catalyst loses activity (cf. A., 1936, 1346). Dehydrogenation of cyclohexane begins at about 335° , but at $>460^\circ$ "cracking" becomes significant and the catalyst loses activity. The apparent activation energy is 8.3 kg.-cal. At 475° , C_2H_{16} undergoes cracking, C is deposited, and the catalyst loses activity. At room temp., C_6H_6 in H_2 is polymerised, and at higher temp. the H_2 also disappears. J. G. A. G.

Hydrogenation of acetylene and ethylene with palladium as catalyst. M. FISCHER and C. A. KNORR (Z. Elektrochem., 1937, 43, 608).—The rate of charge of a Pd wire by H_2 at room temp. \propto the H_2 pressure over the range 36—720 mm. In a vac., part of the H_2 is evaporated rapidly but the remainder is only slowly liberated. The discharge of the wire by C_2H_4 is more rapid and increases with the C_2H_4 pressure, but is not \propto the C_2H_4 pressure over the range 120—720 mm. The rate of discharge by C_2H_2 is independent of the C_2H_2 pressure over the range 30—720 mm. It is concluded that C_2H_2 is the more strongly adsorbed by the Pd. In each case the rate of dehydrogenation decreases with time according to the equation $d^2[H]/dt^2 + ad[H]/dt + b = 0$. J. W. S.

Destructive catalytic hydrogenation of xylene and solvent naphtha.—See B., 1937, 875.

Kinetics of the synthesis of methyl alcohol. G. NATTA and G. PASTONESI (*Chim. e l'Ind.*, 1937, **19**, 313—318).—The formation of MeOH is assumed to occur in two consecutive stages, viz., $\text{CO} + \text{H}_2$ (slow) and $\text{CH}_2\text{O} + \text{H}_2$ (very fast). The variation of the velocity coeffs. with temp. is calc. and the heat of activation of the first stage is found to be 21,000 g.-cal. for a catalyst consisting almost entirely of ZnO. The reaction isotherms which determine the variation of the partial pressure of MeOH as a function of the time of contact with the catalyst for total pressures of 180 and 240 atm. are calc. From these data it is possible to calculate the yield of MeOH for a given vol. of catalyst, when the pressure, gas velocity, and the variation of the temp. of the catalyst as a function of its thickness are known. O. J. W.

Iron-aluminium mixed oxide catalysts for water-gas synthesis.—See B., 1937, 863.

Oxidation of phenols by hydrogen peroxide in presence of inorganic catalysts.—See A., II, 413.

Polarographic studies with the dropping mercury cathode. LXIX. **Hydrogen overpotential in light and heavy water.** J. HEYROVSKY (*Coll. Czech. Chem. Comm.*, 1937, **9**, 273—301; cf. this vol., 414).—Existing data contradict the hypothesis that H^+ and D^+ are deposited at the cathode at different rates, but are consistent with the view that H^+ and D^+ are deposited indifferently and reversibly, and that H_2 and D_2 are formed by way of the union of the deposited H (and D) atoms with the H^+ (and D^+) of the solvent. The rate of the latter reaction in D_2O is 5.4 fold $<$ in H_2O since the ionic product and therefore the rate of dissociation of D_2O is 5.4-fold $<$ in H_2O . The separation coeff. is deduced in terms of the ionisation consts. of H_2O , HOD , and D_2O , and a formula, which takes into account the adsorption of freshly formed H_2 and D_2 at the interphase, is deduced for the overpotential current-voltage curves; it leads to val. for the difference between the overpotentials in H_2O and D_2O consistent with the observed val. According to the theory, the factor b of the $b \log i$ term of the overvoltage relation varies from $1.5RT/F$ to $2RT/F$ as found experimentally. The changes of electroreduction potential of maleic acid and of H_2O_2 when the solvent is changed from D_2O to H_2O are interpreted. J. G. A. G.

Electrolysis of iodine monochloride in various solvents. C. SANDONNINI and N. BORGHELLO (*Atti R. Accad. Lincei*, 1937, [vi], **25**, 46—52).—The electrolysis of ICl and of I in AcOH and in PhNO_2 with Pt electrodes is described. The cathode and anode compartments were separated by porous glass diaphragms. With ICl in AcOH the concn. of both halogens increases at the anode, but the ratio $\text{I}:\text{Cl}$ decreases. The results agree with the view that the solution contains a small amount of I^+ and $(\text{ICl})_2^+$ ions, the latter having a much higher migration velocity. In PhNO_2 solutions, however, the results cannot be explained in this way. In the electrolysis

of I in these solvents the transport of I to the anode is confirmed. O. J. W.

Electrolytic formation of persulphate. III. **Electrodes.** R. MATSUDA and T. NISHIMORI (*Bull. Chem. Soc. Japan*, 1937, **12**, 331—335; cf. this vol., 37).—The current efficiency for the electrolysis of $15N\text{-H}_2\text{SO}_4$ is increased by igniting the Pt anode in flames of $\text{C}_2\text{H}_2 > \text{coal gas} > \text{H}_2$. The total current efficiency increases, and that relative to Caro's acid decreases, as the length of the Pt cathode is decreased, and both rise to max. as the current increases. A C anode is disintegrated during electrolysis of aq. $(\text{NH}_4)_2\text{SO}_4$ alone or with H_2SO_4 or NH_3 . A PbO_2 anode affords a low current efficiency. J. G. A. G.

Production of coloured rings in a mass of a salt by electrolysis. T. PECZALSKI (*Compt. rend.*, 1937, **205**, 120—121; cf. A., 1928, 113).—Coloured layers concentric with a cylindrical cathode are formed in masses of NaCl or KCl on electrolysis at 680° . The coloration is independent of the nature of the electrodes used. A. J. E. W.

Electrolysis in phosphate melts. III. **Electrolysis of molybdic acid in fused phosphoric acid and fused alkali phosphates.** H. HARTMANN and U. CONRAD (*Z. anorg. Chem.*, 1937, **233**, 313—320).—The electrolysis was studied in melts of varying compositions, with varying temp. and c.d. In acid melts ($\text{P}_2\text{O}_5:\text{Na}_2\text{O} > 1$) and at low c.d. the product was Mo^{III} and Mo^{IV} phosphates; at higher c.d. MoP was also formed. In alkaline melts ($\text{P}_2\text{O}_5:\text{Na}_2\text{O} < 1$) MoO_2 was obtained, and at higher temp. the metal was deposited in fine needles. F. J. G.

Electrochemical production of sodium chloride.—See B., 1937, 902.

Electrodeposition of iron from ferrous chloride baths.—See B., 1937, 918.

Electrodeposition of tin from acid sulphate solutions.—See B., 1937, 924.

Electrochemical study of corrosion of metals.—See B., 1937, 928.

Electrolytic oxidation of aspartic acid and malonic acid. Formation of aldehydes by the electrolytic oxidation of α -amino-acids.—See A., II, 402.

"Active oxalic acid." E. ABEL [with R. JOKISCH, R. LARISCH, and H. SASSMANN] (*Z. Elektrochem.*, 1937, **43**, 629—632).—Mixtures of aq. $\text{H}_2\text{C}_2\text{O}_4$ and I which have been irradiated react much more rapidly when subsequently stored in the dark than do solutions kept in the dark throughout (A., 1935, 587). The effect gradually disappears but persists for several hr. The production of the active material, but not its stability, is dependent on the presence of I . The decrease of active material is independent of the $[\text{I}]$ at const. $[\text{KI}]$ and inhibited by increased $[\text{KI}]$ at const. $[\text{I}]$. The effect is attributed to an intermediate product of undetermined nature. J. W. S.

Continuous absorption spectrum of chlorine and the photo-synthesis of hydrogen chloride. N. S. BAYLISS (*Trans. Faraday Soc.*, 1937, **33**,

1339—1342).—From the continuous absorption of Cl_2 (this vol., 485) it is deduced that the only primary process which need be assumed in the photosynthesis of HCl in the absence of O_2 is photo-dissociation of Cl_2 mols. into atoms, and in accordance with this view the quantum yield, temp. coeff., and energy of activation of the reaction are almost independent of the λ of the exciting radiation. The slight change of quantum yield with λ observed at low pressures is attributed to a difference between Cl ($^2P_{1/2}$) and Cl ($^2P_{3/2}$) atoms, either in initiating chains or in reacting with inhibitors. J. W. S.

Theory of the latent image. G. NADJAKOFF (Naturwiss., 1937, 25, 475—476).—It is considered that Ag_2S mols. render AgBr passive to the action of photographic developers, since pure AgBr in absence of gelatin is reduced by developer at the same rate whether it has been exposed to light or not. This theory explains the fogging produced by pressure and chemical action, the latter being caused by the production of new, non-passive crystal surfaces. The blackening effect of supersonic waves can be similarly explained. The increase of sensitivity during ripening of the emulsion is due to the fact that Ag_2S mols. become photochemically activating. The ripening process consists of the increase of photochemically active mols. on the surface of the AgBr crystals. A. J. M.

Photographic development and the latent image. R. M. EVANS and W. T. HANSON, jun. (Phot. J., 1937, 77, 497—515).—A new theory of the latent image and development is proposed. It is largely based on Webb's work on the quantum mechanics of the action of light on a Ag halide crystal (cf. this vol., 254). It is suggested that light action lifts electrons from low levels ($4P$ or U) to the $5S$ level, whence they travel to impurity specks which permit them to drop to the slightly lower F level. The concn. of electrons at these spots is identified with the sensitivity specks of earlier theories, i.e., the latent image centre, having increased developability. Developers are reducing agents of given range of reduction potential, and have characteristic adsorptive isotherms for Ag halide crystals, being considered as reduced dye forms. The various substances in an emulsion are considered as adsorbed on the crystal in exchange equilibrium; the formation of an F level concn. decreases the surface work function of the crystal. Adsorbed developing agent attains a definite reduction potential. If this is $>$ the surface potential, electrons enter the lattice and metallic Ag is released ("chemical development"). "Chemical-physical development" is due to the solvent action of the developer on Ag halide, forming Ag complexes which are immediately reduced, giving a supersaturated solution which deposits Ag on any Ag nuclei already present. Solarisation will be the formation of so large a concn. of electrons at a sensitivity speck that metallic Ag and Br are released and the lattice is ruptured, and readjusts itself to the original surface conditions, giving a crystal free to repeat the cycle. The Ag released is chemical-physically developable, but not chemically. A print-out image is postulated

to be such that solarisation centres become sufficiently numerous to be visible. The importance of the type of developer in relation to theories of the latent image is stressed, and numerous effects, e.g., desensitisation, the action of oxidising agents, effects of Br acceptors, etc., are shown to be predictable from the theory. J. L.

Influence of light and carbon dioxide on photosynthesis.—See A., III, 367.

Interstitial and "Bertholide" compounds. J. S. ANDERSON (Chem. and Ind., 1937, 766—769).—A review. J. S. A.

Active hydrogen, oxygen, and nitrogen at pressures up to 20 mm. A. KLEMENC (Z. physikal. Chem., 1937, 179, 393—394).—Comments on Harteck and Roeder's paper (this vol., 316). R. C.

Preparation of pure water in the laboratory. F. RIMATTEI and J. PETIT (Bull. Soc. Chim. biol., 1937, 19, 1129—1133).—The H_2O is distilled with suitable columns through two flasks containing $\text{K}_2\text{Cr}_2\text{O}_7\text{--H}_2\text{SO}_4$ and $\text{Ba}(\text{OH})_2$ respectively. The use of distilling columns, chemical reagents, and a technique not involving intermediary manipulations is indispensable in order to obtain H_2O of which the conductivity is 10^{-6} . P. W. C.

Precipitation in the cold of a cupric salt by an alkali carbonate. (MLLE.) S. HÉMAR (Compt. rend., 1937, 204, 1739—1740).—Ppts. amorphous to X-rays have been prepared by mixing mainly equiv. quantities of CuCl_2 , CuSO_4 , or $\text{Cu}(\text{NO}_3)_2$ with H carbonates and carbonates of Na and K . With H carbonates the ppt. is $3\text{CuCO}_3 \cdot 2\text{CuO} \cdot x_1\text{H}_2\text{O}$ (solutions 0.05N and 0.125N) and $3\text{CuCO}_3 \cdot \text{CuO} \cdot x_2\text{H}_2\text{O}$ (solutions 0.25—1.0N). With carbonates the ppt. is a definite compound only when mols. of Cu^{II} salt/mols. of carbonate > 0.6 ; with solutions 0.025—0.05N the ppt. is $3\text{CuCO}_3 \cdot 5\text{CuO} \cdot y_1\text{H}_2\text{O}$, and with solutions 0.125—1.0N $\text{CuCO}_3 \cdot \text{CuO} \cdot y_2\text{H}_2\text{O}$. With H carbonates the ppt. changes in contact with the mother-liquor to $\text{CuCO}_3 \cdot \text{CuO} \cdot 1.5\text{H}_2\text{O}$ (malachite), sometimes via $\text{CuCO}_3 \cdot \text{Na}_2\text{CO}_3 \cdot 3\text{H}_2\text{O}$ (I), or $5\text{CuCO}_3 \cdot \text{CuO} \cdot \text{K}_2\text{CO}_3 \cdot 12\text{H}_2\text{O}$ (II). In some cases (II) changes to $2\text{CuCO}_3 \cdot \text{CuO} \cdot 1.5\text{H}_2\text{O}$ (azurite). With carbonates the ppt. becomes CuO , malachite, or $\text{CuCO}_3 \cdot \text{Na}_2\text{CO}_3 \cdot n\text{H}_2\text{O}$ (III). The K salt corresponding with (III) is unstable. Under 50 atm. of CO_2 the usual transformation is to azurite via malachite or (II) (H carbonates), or malachite, (I), and (II) (carbonates). R. S. B.

Displacement reactions in fused pyridinium hydrochloride solutions. A. F. SCOTT and C. S. COE (J. Amer. Chem. Soc., 1937, 59, 1576—1577).—The order in which metals displace one another in pyridinium hydrochloride is: Cu , H , Ag , Sb , Bi , Hg , As , Au , Pt . E. S. H.

Magnesium arsenates. H. GUÉRIN (Compt. rend., 1937, 204, 1740—1741; cf. A., 1936, 439).— $\text{Mg}_3(\text{AsO}_4)_2 \cdot 10\text{H}_2\text{O}$ (I), $\text{Mg}_2\text{H}_2(\text{AsO}_4)_2 \cdot 14\text{H}_2\text{O}$ (II), and $\text{MgH}_4(\text{AsO}_4)_2$ have been prepared. On dehydration (I) and (II) give the hydrates 6, 5, 3, 2, and $1\text{H}_2\text{O}$ and 4, 3, 2, and $1\text{H}_2\text{O}$, respectively. $\text{Mg}_3(\text{AsO}_4)_2$ (III), $\text{Mg}_2\text{As}_2\text{O}_7$ (IV), and $\text{Mg}(\text{AsO}_3)_2$ (V) have been heated in a vac. at 400—1200°. (V) decomposes at

600—800°: $2(V) = (IV) + As_2O_5$; $As_2O_5 = As_2O_3 + O_2$. Above 800° $3(IV) = (III) + As_2O_3 + O_2$, and above 1100° $(III) = 3MgO + As_2O_3 - O_2$. (III) differs from the alkaline-earth arsenates, which are stable at 1455—1635°, but (IV) and (V) resemble in their decomp. the corresponding alkaline-earth salts. R. S. B.

Mechanism of dehydration of calcium sulphate hemihydrate. II. Observations with large crystals. H. B. WEISER and W. O. MILLIGAN (J. Amer. Chem. Soc., 1937, 59, 1456—1458; cf. A., 1936, 1078).—Dehydration curves and X-ray analysis confirm that the hemihydrate is a true compound, not a zeolite. E. S. H.

Decomposition of water by metals and metallic couples. A. OLIVERIO and O. BELFIORE (Annali Chim. Appl., 1937, 27, 284—292; cf. A., 1932, 1099).—The decomp. of H_2O by the Zn-Ni couple increases with rise in temp. and is greatest when the ratio Zn:Ni = 1:0.25. From the metals which follow Zn in the electrochemical series only couples containing Fe decompose H_2O . From a study of the Zn-Ni, Zn-Cr, Zn-Fe, Zn-Cd, Zn-Co, Zn-Pb, Zn-Cu, Zn-Pt, Fe-Cd, Fe-Cu, and Fe-N couples it is concluded that decomp. depends more on the overvoltage of the nobler element with respect to H than on its position in the electrochemical series. L. A. O'N.

Improved method for igniting thermite reactions. O. C. KLEIN (J. Chem. Educ., 1937, 14, 320).—A mixture of $KMnO_4$ and glycerol, used to replace the usual Mg ribbon, reduces the risk of accident. L. S. T.

Gallium. II. Extraction of gallium and germanium from germanite. III. Electrodeposition, purification, and dissolution of gallium. F. SEBBA and W. PUGH (J.C.S., 1937, 1371—1373, 1373—1374; cf. this vol., 473).—II. Ga and Ge are extracted from germanite by treatment with conc. aq. NaOH. Accompanying metals, but not As, remain as insol. sulphides. The separation of Ga and Ge from each other and from As is described.

III. The conditions for obtaining molten Ga by electrolysis of warm aq. solutions of $Ga(OH)_3$ in NaOH are described. The deposit contains traces of Pb, Sn, and Pt, which are removed completely by washing with hot aq. HCl and then HNO_3 . The action of HCl, H_2SO_4 , and HNO_3 on Ga is described. E. S. H.

Preparation of ytterbous sulphate and its elimination from lutecium sulphate. J. K. MARSH (J.C.S., 1937, 1367—1368).— $Yb_2(SO_4)_3$ is reduced to $YbSO_4$ (95% yield) at a cathode of Pb amalgam. $YbSO_4$ is stable when pure, but decomposes rapidly in presence of salts of heavy metals. Purity of the electrolyte and Pb amalgam is a crit. factor. E. S. H.

Oxidation action of graphitic oxide and active carbon plus oxygen on aromatic amines.—See A., II, 409.

Pneumatolytic synthesis of silicates. C. J. VAN NIEUWENBURG (Chim. et Ind., 1937, 38, 226—

232).—The author's work is summarised (cf. A., 1931, 322, 1381; 1932, 906; 1934, 614; 1935, 441). G. H. C.

Explosiveness of ammonium nitrate-ammonium sulphate mixtures.—See B., 1937, 903.

Reversible action of iodine vapour on dry potassium nitrite. Influence of the miscibility of this salt with the corresponding nitrate. M. DODÉ (Compt. rend., 1937, 205, 137—139; cf. this vol., 81, 463).—The variation of the NO pressure in the system KNO_3 - KNO_2 -KI-I with the composition of the KNO_3 - KNO_2 phase, at const. temp., is in agreement with theory, assuming this phase to be an ideal solution. A. J. E. W.

Alkali phosphates and arsenates. IV. Secondary sodium arsenate. H. MENZEL and W. HAGEN (Z. anorg. Chem., 1937, 233, 209—235).—The system Na_2HAsO_4 - H_2O has been studied by means of solubility and v.p. measurements and X-ray analysis. Besides the known dodeca- and hepta-hydrates, penta- and mono-hydrates, but not a hemihydrate, exist. The anhyd. salt is very easily obtained as metastable solid phase in the region of the monohydrate, and in the system Na_2HAsO_4 - H_2O vapour the transition anhyd. \rightarrow monohydrate could not be observed, and the transition penta- \rightarrow monohydrate could be observed only when the previous history of the specimen was such as to ensure the presence of nuclei of the monohydrate. Transition points are: anhyd. $1H_2O$, 99.5°; anhyd. (metastable) $5H_2O$, 68.0°; $1H_2O \rightleftharpoons 5H_2O$, 67.4°; $5H_2O \rightleftharpoons 7H_2O$, 56.3°; $7H_2O \rightleftharpoons 12H_2O$, 20.5°. The cryohydric point is -1.138°. F. J. G.

Non-existence of bismuthous bromide $BiBr_2$. A. BARONT (Atti R. Accad. Lincei, 1937, [vi], 25, 195—196).—X-Ray investigations show that $BiBr_2$ is not formed by the direct combination of the elements (cf. A., 1936, 946). The product appears to be a mixture of Bi and $BiBr_3$. O. J. W.

Chemistry in liquid sulphur dioxide. VI. Oxidation and reduction reactions, the formation of complex compounds, and the amphoteric behaviour of sulphites in liquid sulphur dioxide. G. JANDER and H. IMMIG (Z. anorg. Chem., 1937, 233, 295—306).—Reactions in liquid SO_2 , which are analogous to those in H_2O include oxidation of KI by $FeCl_3$ and $SbCl_5$, reduction of I by $SO_3^{''}$ ions, and formation of complex salts, e.g., K_3SbCl_6 and $KSbCl_6$. $SOCl_2$ forms complex "acids," e.g., $(SO)_3(SbCl_6)_2$. $Al_2(SO_3)_3$ behaves as a sparingly sol. amphoteric electrolyte in liquid SO_2 . F. J. G.

Uranyl phosphites. A. CHRETIEN and J. KRAFT (Compt. rend., 1937, 204, 1736—1738).—On adding aq. H_3PO_3 to aq. $UO_2(OAc)_2$ the electrical resistance becomes a max. with equimol. proportions. A yellow gelatinous ppt. of $UO_2HPO_3 \cdot 2H_2O$ (I) is deposited slowly, but with rapid mixing of the reactants an elastic, gummy mass is formed. Aq. $UO_2(OAc)_2$ with excess of HPO_3 in sunlight deposits a green ppt. of variable composition, but with light from a Hg lamp the composition is const. at $UO_2/PO_3 = 1.7$. This green ppt. gives a green solution in HCl which becomes yellow with H_2O_2 , $KMnO_4$, or HNO_3 ; the

ppt. consists of a mixture of (I) and U^{IV} phosphite. (I) in presence of H_3PO_3 is rapidly reduced by light with the formation of H_3PO_4 and U^{IV} phosphite.

R. S. B.

Chemical state of uranium- X_1 which accompanies uranyl salts. R. DE and A. DAS (J. Chim. phys., 1937, 34, 386—400).—A fraction of the radioactive material (I) in aq. uranyl salts is removed by filtering, and this fraction increases with dilution. The fraction of (I) pptd. by $Fe(OH)_3$ sols decreases with increasing concn. of added alkali salts. It is inferred that $U-X_1$ is present as the $(U-X_1)O_2^{--}$ ion derived directly from UO_2 . $U-X_1$ salts are easily hydrolysed giving negatively charged colloids, but the sign of the charge is reversed when the $U-X_1$ becomes quadrivalent.

J. G. A. G.

Explosiveness of potassium and sodium chlorates.—See B., 1937, 903.

Preparation of hydrobromic acid solution of constant b.p. G. DRUCE (J. Chem. Educ., 1937, 14, 394).—A reply to criticism (this vol., 373). No H_2SO_4 or Sn sulphide has been observed in the HBr prepared by Druce's procedure (A., 1923, ii, 65).

L. S. T.

Ethoxides and isopropoxides of manganese and rhenium.—See A., II, 396.

Amorphous and crystallised oxide hydrates and oxides. XXXIII. Amorphous ferric hydroxide as inorganic "oxidation ferment." Catalysed oxidation of acetic and other aliphatic acids by hydrogen peroxide and their combustion to carbon dioxide at 20° . A. KRAUSE and Z. JANKOWSKI (Ber., 1937, 70, [B], 1744—1749; cf. this vol., 252).—Complete oxidation of AcOH to CO_2 is effected at 20° by H_2O_2 in presence of Fe^{III} orthohydroxide (I). Since indefinite amounts of AcOH can thus be oxidised, the change is truly catalytic. Reaction is of the first order and is expressed: $O \cdot Fe \cdot O \cdot Fe(OH) \cdot O \cdot Fe(OH) \cdot O \cdot Fe(OH)_2 + H_2O_2 \rightarrow$

$O \cdot Fe \cdot O \cdot Fe \cdot O \cdot Fe \cdot O \cdot Fe(OH)_2$ (II) + $2H_2O$; (II) + AcOH \rightarrow (I) + CO_2 + $\cdot CH_3$. $\cdot CH_3$ is converted into CHO, which gives HCO_2H oxidised to CO_2 (loc. cit.). Sorption of AcOH by (I) proceeds simultaneously with the oxidation. Similar oxidation is observed with lactic acid and the sorption is relatively strong; at no period of the change are Fe ions present in the solution. $H_2C_2O_4$ is unsuitable for investigation in heterogeneous system since it dissolves (I) in a relatively short time; its behaviour towards cryst. goethite preps. is similar although these are generally difficultly sol. Bu^tCO_2H is oxidised with great difficulty and the course of the change is influenced by the partial dissolution of (I). *d*-Tartaric acid behaves analogously.

H. W.

Ferroamminopentacyanides. R. UZEL and K. FUNK (Coll. Czech. Chem. Comm., 1937, 9, 254—264).—The following salts were pptd. by adding aq. $Na_3[Fe(CN)_5NH_3]$ ($= Na_3[R]$) to solutions of the nitrates and chlorides of the metals: $Hg_2[R] \cdot 3H_2O$; $Bi[R] \cdot 4H_2O$; $Cd_3[R]_2 \cdot 5H_2O$; $Co_3[R]_2 \cdot 10H_2O$; $Zn_3[R]_2 \cdot 12H_2O$; $Pb_3[R]_2 \cdot 5H_2O$; $Cu_3[R]_2 \cdot 10H_2O$; $Tl_3[R] \cdot 4H_2O$; $Mn_3[R]_2 \cdot 8H_2O$. By heating aq.

$Na_3[R]$ with the appropriate amines, the following salts were prepared: $Na_3[Fe(CN)_5NHMe_2] \cdot 2H_2O$; $Na_3[Fe(CN)_5NMe_3]$; $Na_3[Fe(CN)_5NH_2Et] \cdot 2H_2O$; $Na_3[Fe(CN)_5NHEt_2] \cdot 2H_2O$; $Na_3[Fe(CN)_5NEt_3] \cdot 2H_2O$; $Na_3[Fe(CN)_5NH_2Pr^i] \cdot 2H_2O$; $Na_3[Fe(CN)_5NH_2Bu^i] \cdot 2H_2O$; $Na_3[Fe(CN)_5NH_2 \cdot CH_2Ph] \cdot 2H_2O$.

J. G. A. G.

Isothermal decomposition of the peroxides of nickel. F. FRANCOIS and (MLLE.) M. L. DELWAULLE (Compt. rend., 1937, 205, 282—284).—Composition-time curves indicate that Ni_2O_3 and a higher peroxide are present at first. The latter decomposes rapidly affording Ni_2O_3 and this more slowly forms Ni_3O_4 , which is stable up to 40° but at higher temp. decomposes further giving $Ni(OH)_2$.

F. J. G.

Dipolar complex salts.—See A., II, 389.

Iridium and rhodium selenides and tellurides. W. BILTZ (Z. anorg. Chem., 1937, 233, 282—285).—The highest Rh telluride is Rh_2Te_5 , and not $RhTe_2$, and the highest Ir selenides and tellurides have the composition Ir : (Se or Te) = 1 : 2.89 (cf. A., 1934, 45). These compounds and Rh_2Se_5 all have pseudopyrite structures. d^{25} are: Rh_2Se_5 , 6.96; Rh_2Te_5 , 8.43; "IrSe_{2.89}", 8.05; "IrTe_{2.89}", 9.5.

F. J. G.

Affinity. LXXIV. Iridium sulphides. W. BILTZ, J. LAAR, P. EHRLICH, and K. MEISEL (Z. anorg. Chem., 1937, 233, 257—281).—The system Ir-S has been studied using various methods of prep. in conjunction with v.p. measurements and X-ray analysis. The only compounds formed are Ir_2S_3 , IrS_2 , and Ir_3S_8 , although solid solutions exist up to Ir : S = 1 : 5 approx. IrS_2 has a pseudopyrite structure. No indications of the existence of IrS or IrS_3 (A., 1934, 45) could be obtained. d^{25} are: Ir_2S_3 , 9.64; IrS_2 , 8.43; Ir_3S_8 , 7.18.

F. J. G.

Co-ordination compounds of semicarbazide, phenylsemicarbazide, *m*-tolylsemicarbazide, and aminoguanidine.—See A., II, 404.

Emission spectrum analysis as physical method in analytical chemistry. A. SCHLEICHER (Z. anal. Chem., 1937, 110, 94—102).—A lecture.

J. S. A.

Qualitative-semi-quantitative evaluation of spectrograms in spectral analysis. K. BENNEWITZ and H. ROTGER (Angew. Chem., 1937, 50, 724—725).—A series of comparison spectra is taken, under standardised conditions, of graded concns. of the pure elements sought (e.g., 0.1, 0.01, 0.001M) between spectroscopically pure C electrodes. Spectra of solutions to be analysed are taken similarly, and are compared with a positive print of the comparison spectra.

J. S. A.

New photometric principle for quantitative spectral analysis. W. GERLACH and W. ROLLWAGEN (Naturwiss., 1937, 25, 570).—A method for determining the relative intensities of lines in the spectrum furnished by an alloy, when the lines due to one component are considerably brighter than those due to the other, is given.

A. J. M.

Index of the efficiency of the methods of quantitative analysis. E. REICHEL (Z. anal. Chem.,

1937, 109, 385—391).—The errors of analysis are discussed, and an index of accuracy is defined as $G = 1/(\text{wt. of material} \times \% \text{ error})$. $G = 20$ —100 for most micro-analytical methods, but with exceptional sensitivity may rise to 2×10^7 , as in the determination of Au by Haber and Jaenicke's method (A., 1925, ii, 997). R. S. B.

Inorganic chromatography. II. Separation of acids. G. M. SCHWAB and G. DATTLER (Angew. Chem., 1937, 50, 691—692).—Anions may be separated and detected by preferential adsorption on a column of Al_2O_3 which has been treated with dil. HNO_3 . The order is OH' , PO_4''' , F' , CrO_4'' and $\text{Fe}(\text{CN})'''$, SO_4'' , $\text{Cr}_2\text{O}_7''$ and $\text{Fe}(\text{CN})_6'''$, Cl' , NO_2' , MnO_4' , ClO_4' , S'' . F. J. G.

Inorganic analysis by chromatography. G. M. SCHWAB and K. JOCKERS (Z. Elektrochem., 1937, 43, 610).—Cf. A., 1936, 810, 1218; this vol., 150. J. W. S.

Importance of hydrogen-ion concentration in volumetric analysis. T. T. COCKING (Ind. Chem., 1937, 13, 238—241).—The change in p_H during titration of strong and weak acids with strong alkalis is illustrated graphically and the choice of suitable indicators is discussed. A. R. P.

Electrotitration of acids in benzene solution. M. A. RABINOVITSCH (Trav. Inst. Chim. Charkov, 1935, 1, 99—107).—In the titration of $\text{CH}_2\text{Cl}\cdot\text{CO}_2\text{H}$ (I) or $\text{CCl}_3\cdot\text{CO}_2\text{H}$ (II) by NPhMe_2 , in C_6H_6 solution containing NEt_4I and quinhydrone, the potential rises to a max. and then falls. Addition of (I) to (II), both in C_6H_6 , leads to a more negative potential, due to the reaction (I) + (II) $\text{CH}_2\text{Cl}\cdot\text{CO}_2\text{H}_2 + \text{CCl}_3\cdot\text{CO}_2'$; when considerable excess of (I) is present the potential again becomes positive. On the other hand, addition of (II) to (I) raises the positive potential, irrespective of the (I)/(II) ratio. R. T.

Colorimetric detection of metallic corrosion by means of p_H indicators.—See B., 1937, 929.

Volumetric electro-analysis of gases. Apparatus for determination of hydrogen and for separation from methane. A. DASSLER (Angew. Chem., 1937, 50, 725—728).—The absorption vessel contains a heavily Pd-coated Ni gauze electrode, immersed in aq. KOH, and connected through a reversing switch to a Ni—Cd accumulator. When cathodically polarised, the electrode absorbs O_2 (up to 20 c.c. for 3 g. of Pd) and catalyses the union of $2\text{H}_2 + \text{O}_2$ mixtures. When anodically polarised, the electrode absorbs H_2 from gases containing no O_2 . CO slows down the absorption of H_2 ; in the presence of traces of CO H_2 is best determined by adding O_2 , and exposing to the cathodically polarised electrode, whereby CO and H_2 are burned simultaneously. The excess of O_2 is then absorbed in the same way. CH_4 and other hydrocarbons are inert, and are recovered quantitatively. J. S. A.

Microanalytical determination of water in inorganic substances. I. F. HECHT (Mikrochim. Acta, 1937, 1, 194—204).— H_2O (e.g., in minerals) is determined by ignition in a current of dry air, using a modified Pregl C—H combustion apparatus. SO_2 , HCl, etc. are removed by a filling of $\text{PbO} + \text{PbO}_2$,

maintained at 180 — 190° , at the exit end of the combustion tube. J. S. A.

Determination of water in superphosphate.—See B., 1937, 955.

Manganese as a catalyst for the determination of hydrogen peroxide with potassium bromate. L. SZEBELEDEY and W. MADIS (Z. anal. Chem., 1937, 109, 391—396).—Approx. 20 c.c. of the neutral solution of $0.1N\text{-H}_2\text{O}_2$ are made up to 25 c.c., treated with 1 g. of MnCl_2 and 25 c.c. of $N\text{-HCl}$, and titrated with $0.1N\text{-KBrO}_3$ until a yellow colour is obtained (at 0.5 — 1.0 c.c. from the equiv. point). After heating at 40° the titration is continued until a permanent yellow colour is obtained: $3\text{H}_2\text{O}_2 + \text{HBrO}_3 \rightleftharpoons 3\text{H}_2\text{O} + \text{HBr} + 3\text{O}_2$; $5\text{HBr} + \text{HBrO}_3 = 3\text{Br}_2 + 3\text{H}_2\text{O}$; $2\text{MnO} + \text{Br}_2 + \text{H}_2\text{O} \rightleftharpoons \text{Mn}_2\text{O}_3 + 2\text{HBr}$; and $\text{Mn}_2\text{O}_3 + \text{H}_2\text{O}_2 = 2\text{MnO} + \text{H}_2\text{O} + \text{O}_2$. MnSO_4 may also be used as catalyst, but the solution requires preheating to 40° , and remains colourless up to the equiv. point. R. S. B.

Fractional reaction for chlorate, bromate, and iodate. N. A. TANANAIEV and M. S. VOSCHITSCHINSKAJA (J. Appl. Chem. Russ., 1937, 10, 1118—1121).—Excess of $N\text{-AgNO}_3$ is added to 5 ml. of solution, which is filtered, Zn and H_2SO_4 are added to the filtrate, followed after 1—2 min. by 3—4 ml. of HNO_3 , and the solution is boiled. A ppt. of AgCl is obtained in presence of < 0.0076 mg. of KClO_3 . The residue from the above filtration is washed, and boiled for 1 min. with 5 ml. of aq. KI, the suspension is filtered, and the filtrate is boiled with 2—3 ml. of HNO_3 and 1 ml. of saturated aq. $\text{Mn}(\text{NO}_3)_2$; a ppt. of MnO_2 is obtained in presence of < 0.83 mg. of KBrO_3 . 5 ml. of solution are boiled with 5 ml. of saturated aq. BaCl_2 and 1 drop of aq. NaOH , and the ppt. is collected, washed, and dissolved in hot 30% HCl . 1 ml. of 20% H_2SO_4 and 2 ml. of $0.05N\text{-NH}_4\text{CNS}$ are added to the solution; a coloration due to liberated I develops (< 0.13 mg. of KIO_3). Cl' , Br' , I' , and SO_4'' do not interfere with the above reactions. R. T.

Detection of bromide and iodide in the presence of large quantities of chloride. R. G. AICKIN (J. Proc. Austral. Chem. Inst., 1937, 4, 267—269).—The specimen is dissolved in H_2O (0.2 c.c.) in a tube 6—8 cm. long and 1 cm. diameter, and 0.2 c.c. of 25% H_2CrO_4 is added. A moist paper impregnated with fluorescein is placed over the end of the tube while the solution is warmed for 5 min. The colour produced (due to eosin) is compared with standards. 1×10^{-6} g. of Br' can be detected in presence of large amounts of Cl' . Successive extraction of a solution of a chloride with H_2O_2 and CHCl_3 and with CHCl_3 and aq. HNO_2 permits detection of 1×10^{-5} g. of I' and Br' , respectively. J. W. S.

Mercurimetric determination of iodides in presence of diphenylcarbazide as indicator. A. JÍLEK and G. KOUDELA (Coll. Czech. Chem. Comm., 1937, 9, 265—272).—When I' is titrated with Hg'' in the presence of diphenylcarbazide (I), the violet colour developed at the end-point is obscured by the colour of HgI_2 pptd., but if $\text{C}_5\text{H}_5\text{N}$ is present under

sp. conditions the HgI_2 gives a white substance and the end-point is sharp and stoichiometric. <130 mg. of I' in 50—100 c.c. containing 2 c.c. of 0.5N- HNO_3 , 7 c.c. of 10% aq. $\text{C}_5\text{H}_5\text{N}$, and 3—6 drops of 2% alcoholic (I) is determined by means of slightly acid 0.02N- $\text{Hg}(\text{NO}_3)_2$ (4 c.c. of 1:1 NO_3^- per litre) in presence of Li, Na, K, NH_4^+ , Mg^{++} , Ca^{++} , Sr^{++} , Ba^{++} , Cd^{++} , and Fe^{++} . I' is determined in presence of Cl' when 1—1.5 c.c. of 10% aq. $\text{C}_5\text{H}_5\text{N}$ is added for each 10 c.c. of 0.02N- $\text{Hg}(\text{NO}_3)_2$ required. J. G. A. G.

Determination of iodine in soil.—See B., 1937, 954.

Detection and determination of minute amounts of fluorine. E. R. CALEY and J. M. FERRER, jun. (Mikrochim. Acta, 1937, 1, 160—163).—0.05 mg. of CaF_2 may be detected by the etching of an unwaxed cover glass in a covered Pb capsule of small vol., maintained at 140—150°. J. S. A.

Determination of fluorine in foods.—See B., 1937, 975.

Determination of small quantities of oxygen in gases and liquids. I. J. W. MACHATTIE and J. E. MACHONACHIE (Ind. Eng. Chem. [Anal.], 1937, 9, 364—366).— O_2 is absorbed by Cu wetted with aq. NH_3 and NH_4Cl the resulting oxide is washed off with the same solution, and Cu is determined in the washings by colorimetric titration. The accuracy is 3% for 0.02—2 ml. of O_2 . E. S. H.

Sensitive test for sulphur with nascent hydrogen. E. SCHROER (Mikrochem., 1937, 22, 338—344).—S, in sulphates and all other S compounds, is reduced by nascent H to H_2S , which may be best detected by the blue luminosity conferred on the flame of burning H_2 . Org. compounds may be reduced to mercaptans, detectable in minute amounts by their odour. SO_2 and other S compounds in gases may be detected by bubbling successively through Zn + 20% HCl and aq. $\text{Cd}(\text{OAc})_2$. The limit of detection is about 0.0001 mg. of S.

J. S. A.

Determination of sulphur and silicon in iron and steel.—See B., 1937, 921.

Quantitative oxidation of colloidal selenium and its application in the volumetric determination of small amounts of selenium. W. C. COLEMAN and C. R. McCROSKY (J. Amer. Chem. Soc., 1937, 59, 1458—1460).—Standard solutions of KBrO_3 , ICl , or KIO_3 can be used for the titration of colloidal SeO_2 solutions in presence of a strong acid. The error is about 0.3%. The reactions involved are discussed. E. S. H.

Photometric determination of ammonia. R. CRISMER (Bull. Soc. Chim. biol., 1937, 19, 1000—1009).—The colorimetric method of Borsook (A., 1935, 1140) is modified, the NH_3 being distilled and the colour developed with $p\text{-C}_6\text{H}_4\text{Me}\cdot\text{SO}_2\cdot\text{NHCl}$ being measured with a spectrophotometer. The method is used for 3 to 5×10^{-6} g. of NH_3 and is suitable for determinations in urine and perfusion fluids but is not sensitive enough for determinations in blood. P. W. C.

Determination of nitrogen in soils and plant materials.—See B., 1937, 954.

Determination of nitrous and nitric nitrogen in soils.—See B., 1937, 954.

Rapid determination of nitrite in meat extracts.—See B., 1937, 973.

Quantitative drop analysis. VIII. Determination of phosphorus. R. LINDNER and P. L. KIRK (Mikrochem., 1937, 22, 300—305).—Simple PO_4^{+++} solutions containing 0.0005—0.01 mg. of P are treated with an equal vol. of $\text{HNO}_3 + \text{H}_2\text{SO}_4$, and pptd. with 4 vols. of $(\text{NH}_4)_2\text{SO}_4 + \text{NH}_4$ molybdate reagent at room temp. The ppt. is washed with 50% EtOH, and dissolved in a measured excess of 0.1N-NaOH at 100°. The excess of NaOH is then titrated back with 0.1N-HCl. Biological materials are ashed dry with Na_2CO_3 at 450°, and the residue is dissolved in $\text{H}_2\text{SO}_4 + \text{HNO}_3$. J. S. A.

Elimination of the phosphate radical in qualitative analysis. L. W. N. GODWARD and A. M. WARD (J.C.S., 1937, 1337—1338).—A concise scheme is based on the elimination of PO_4^{+++} as NH_4 phosphomolybdate by means of NH_4 molybdate. The scheme includes the detection of Ca as CaMoO_4 . E. S. H.

Separation of the phosphoric ion and its volumetric determination. E. CATTELAINE and P. CHABRIER (Compt. rend., 1937, 205, 49—52).— PO_4^{+++} is pptd. as $\text{Pb}_3(\text{PO}_4)_2$ from a solution slightly acidified with AcOH. The ppt., after washing, is dissolved in N- HNO_3 and PbSO_4 pptd. by addition of N- H_2SO_4 . The mixed acids are titrated with N-NaOH using Me-orange as indicator, the titration being continued with 0.1N-NaOH using phenolphthalein. The amount of NaOH required for the second stage of the titration corresponds with the H_3PO_4 content of the solution. C. R. H.

Determination of small amounts of arsenic. G. G. KARANOVITSCH (Trud. Inst. Tschist. Chim. Reakt., 1935, No. 14, 93—95).—The method of Martin and Pien (A., 1930, 1144) serves for determination of amounts of As of the order of 10^{-7} g. R. T.

Osmic acid as redox indicator in volumetric determination of arsenite with potassium bromate. L. SZEBELLEDY and W. MADIS (Mikrochim. Acta, 1937, 1, 226—230).— OsO_4 gives with AsO_3^{+++} in dil. H_2SO_4 solution an immediate bluish-black coloration of colloidal Os, which is oxidised and decolorised by any excess of BrO_3^- . 2 c.c. of 0.25% OsO_4 are used for 50 c.c. of solution containing 5 c.c. of 0.1N- H_2SO_4 . The method may be used micro-analytically. J. S. A.

Determination of arsenic as magnesium pyroarsenate. I. SARUDI (VON STETINA) (Z. anal. Chem., 1937, 110, 117—122).— $\text{MgNH}_4\text{AsO}_4$ is pptd. very slowly from a solution containing NO_3^- . After pptn., conc. aq. NH_3 is added. The ppt. is redissolved in 4N- HNO_3 , and repptd. by the same method. It is finally washed with 10% aq. NH_3 containing 3% of NH_4NO_3 . J. S. A.

Detection of silicic and boric acids. A. REICH (Chem.-Ztg., 1937, 70, 707; cf. A., 1896, ii, 544).—The material is mixed with a 2:1 mixture of H_2SO_4 and HF and the vapours are allowed to impinge on a

drop of H_2O on a watch glass. The white film is studied for solubility and the drop by turmeric paper.

R. S. B.

Determination of small amounts of cyanide in foodstuffs after fumigation.—See B., 1937, 975.

Iodometric determination of alkali. G. S. SMITH (Analyst, 1937, 62, 590—596).—Walker and Gillespie's method (A., 1899, ii, 326) is modified by refluxing the reaction mixture, to which C_6H_6 is added until the reaction is judged to be complete, in which circumstances sol. or freshly pptd. carbonates react quantitatively. Excess of I is removed either by boiling or, more rapidly, by addition of PhOH . The alkali of Na_3AlO_3 and Na_2SiO_3 , but not that of $\text{Na}_2\text{B}_4\text{O}_7$, may be determined by this method.

E. C. S.

Micro-determination of potassium. B. NORBERG (Mikrochim. Acta, 1937, 1, 212—219).—K is pptd. as K_2PtCl_6 by means of $0.02\text{N-H}_2\text{PtCl}_6$ from 0.1 c.c. of solution. The whole is evaporated to dryness at 90 — 95° , and washed twice with 0.1 c.c. of abs. EtOH . The ppt. is collected centrifugally, dried at 95° , and dissolved in 0.045 ml. of phosphate buffer solution (p_{H} 6.98). 0.015 ml. of 2N-KI is added, forming K_2PtI_6 , which is titrated directly with $0.02\text{N-Na}_2\text{S}_2\text{O}_3$. The method is suitable for 0.001—0.01 mg. of K, especially in biological tissues.

Photo-electric determination of potassium in serum.—See A., III, 373.

Determination of total alkalis and micro-gravimetric determination of sodium as sodium magnesium uranyl acetate. (Micro-analysis of mineral waters.) R. DWORZAK and A. FRIEDRICH-LIEBENBERG (Mikrochim. Acta, 1937, 1, 168—193).—Li, K, and Na sulphates are stable at 700° , and are non-hygroscopic, and suitable for determining total alkalis. 5 c.c. of mineral H_2O are evaporated with HCl to render SiO_2 insol. The residue is dissolved in H_2O and filtered into a Ca(OH)_2 suspension, which is boiled for 20—30 min. to ppt. all other ions. Ca is pptd. from the resulting solution by treatment with $(\text{NH}_4)_2\text{CO}_3$ and then $(\text{NH}_4)_2\text{C}_2\text{O}_4$. The residue is evaporated with H_2SO_4 , and ignited at 700° . Na may be pptd. directly as Na Mg UO_2 acetate from most mineral waters without interference from other ions in the relative concns. usually found. The influence of other ions on the pptn. of Na is discussed.

J. S. A.

Determination of lithium. H. GROTHE and W. SAVELSBERG (Z. anal. Chem., 1937, 110, 81—94).—The determination of Li by pptn. as LiF and Li_3PO_4 is critically reviewed. Li is best pptd. as aluminate, which is ignited to $2\text{Li}_2\text{O} \cdot 5\text{Al}_2\text{O}_3$. The acidified Li solution (p_{H} 3) is treated at room temp. with a solution of $\text{KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}$ + an excess of NaOH and brought to p_{H} 12.6, whereby Li aluminate is pptd. In determining Li in Al alloys, Al is pptd. as AlPO_4 from AcOH solutions to avoid co-pptn. of Li as with aq. NH_3 .

J. S. A.

Quantitative drop analysis. VII. **Determination of calcium.** R. LINDNER and P. L. KIRK (Mikrochem., 1937, 22, 291—300; cf. A., 1933, 1262).—Ca is pptd. as CaC_2O_4 by digesting 1 drop

NN (A., I.)

of solution, acidified with HCl , with an equal vol. of 4% aq. $(\text{NH}_4)_2\text{C}_2\text{O}_4$ + 0.1 ml. of saturated aq. NaOAc . The ppt. is collected, dissolved in $6\text{N-H}_2\text{SO}_4$, and treated with an excess of $0.01\text{N-Ce(SO}_4)_2$. The excess is finally titrated back with 0.01N-FeSO_4 . Biological materials are ashed at 450° , the residue being dissolved in HCl . The method is applicable to 0.5 — 12×10^{-6} g. of Ca.

J. S. A.

Rapid determination of calcium and magnesium. N. A. FREZE (Zavod. Lab., 1937, 6, 756—758).—Ca is determined by pptn. as CaC_2O_4 , and Mg by pptn. as Mg(OH)_2 .

R. T.

Analysis of soda-lime glass.—See B., 1937, 911.

Determination of primary calcium phosphate in mixtures of the calcium orthophosphates. H. V. TARTAR, I. S. COLMAN, and L. L. KRETCHMAR (Ind. Eng. Chem. [Anal.], 1937, 9, 384—386).— $\text{Ca(H}_2\text{PO}_4)_2$ is determined by titrating to p_{H} 5.15 with 0.2N-NaOH .

E. S. H.

Determination of metals by the hydroxyquinoline method. S. L. TZINBERG (Zavod. Lab., 1937, 6, 499—501).—The ppt. obtained by adding ammoniacal 8-hydroxyquinoline (I) to aq. Be salts is Be(OH)_2 and is also obtained in absence of (I). Mg may be separated from Ca by pptn. from ammoniacal solution with (I); the ppt. adsorbs Ca when this is present in high concn. Ag is quantitatively pptd. from aq. NH_3 solution as $\text{Ag(C}_9\text{H}_6\text{ON)}_2$.

R. T.

Fractional detection of magnesium in presence of barium, strontium, and calcium. N. A. TANANAEV and R. A. LOVI (J. Appl. Chem. Russ., 1937, 10, 1112—1117).—Slight excess of aq. NH_3 is added to the solution, which is boiled, aq. $(\text{NH}_4)_2\text{CO}_3$ is added, and the solution is filtered from the ppt. of Ba, Ca, and Sr carbonates. The filtrate is boiled with excess of aq. CH_2O , made alkaline (phenolphthalein) with NaOH , and excess of aq. NH_3 is added, when a ppt. of Mg(OH)_2 is obtained in presence of < 0.3 mg. of Mg in 5 ml. of solution. Alternatively, Mg(OH)_2 is pptd. by 5% Ca saccharate; NH_4^+ , but not Ca^{++} , Ba^{++} , or Sr^{++} , interferes.

R. T.

Analysis of magnesium alloys.—See B., 1937, 925.

Determination of magnesium in fertilisers.—See B., 1937, 956.

Detection and determination of heavy metals in cider.—See B., 1937, 968.

Determination of cadmium by internal electrolysis. J. J. LURIE and M. I. TROITZKAJA (Zavod. Lab., 1937, 6, 507).—The method previously described (B., 1937, 49) gives low results when the H_2O used contains Cl; a few drops of aq. $\text{Na}_2\text{S}_2\text{O}_3$ should then be added.

R. T.

Photo-electric determination of copper. J. HEYES (Z. Elektrochem., 1937, 43, 560; cf. A., 1936, 1222).—Cu can be determined by the intensity of its 3247 Å. line in a compressed air- C_2H_2 flame, measured by means of a photo-electric cell.

J. W. S.

Rapid micro-determination of copper and cobalt. I. M. KORENMAN, A. M. LISENKO, and

C. V. MORDUSCHENKO (Zavod. Lab., 1937, 6, 682—684).—The reactions described by Korenman (A., 1934, 49, 1192) are applied to determination of Co (<0.004 mg.) and Cu (<0.01 mg.), by comparing the intensity of coloration of the ppt. of $\text{ZnHg}(\text{CNS})_4$ with that obtained from solutions of known Co and Cu content. Ni, Zn, Cd, Cr, Mn, Pb, Al, Ag, Bi, and Sn^{IV} do not interfere. Should Fe be present the reaction is performed in presence of NaF. The method is applied to analysis of 1—2 mg. of alloys. R. T.

Action of hydrogen on the oxides and sulphides of copper, and determination of copper as cuprous sulphide. V. G. GALLO (Annali Chim. Appl., 1937, 27, 269—284; cf. B., 1928, 56).—The reduction of CuO by H_2 commences at $102\text{--}105^\circ$ and proceeds continuously through the stage of Cu_2O to Cu. Reduction is complete after 9 hr. at 135° or 3 hr. at 380° . The reduction of CuS by H_2 commences at $200\text{--}300^\circ$ and proceeds through a series of solid solutions of CuS and Cu_2S to Cu_2S . The dimorphism of the Cu_2S then determines whether it remains unaltered on continued heating at elevated temp., or whether further reduction takes place as a consequence of the reaction $\text{Cu}_2\text{S} = \text{CuS} + \text{Cu}$, yielding Cu. If H_2 is replaced by H_2S , Cu_2S is always the final product. In the light of these results the Rose method for the determination of Cu as Cu_2S is modified by strongly heating the pptd. CuS for 10—15 min., without addition of S, in a current of dry H_2S , and cooling in a current of H_2 . Results are thereby obtained which do not vary with the time of heating. L. A. O'N.

Reaction between aqueous silver nitrate and cuprous thiocyanate. Indirect argentometric method for the determination of copper and a "spot" test for silver. V. J. OCCLESHAW (J.C.S., 1937, 1438—1440).—Aq. AgNO_3 reacts with CuCNS yielding an equimol. mixture of Ag and AgCNS . The reaction has been adapted to the determination of Cu in neutral or NH_3 solution; the error in determining 0.3—0.5 g. of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is about $\pm 0.3\%$. The reaction can be used as a drop test for Ag.

E. S. H.

Microchemical determination of cupric cation with ammonia, tartaric acid and fructose, potassium ferrocyanide, and potassium ferrocyanide in presence of ammonia. S. AUGUSTI (Mikrochem., 1937, 22, 329—338).—The sensitivity of the Cu-NH_3 coloration is improved by testing the dried residue of the solution, or by inserting a cotton fibre, which turns blue or green, into the solution. The most sensitive test is with aq. NH_3 + solid $\text{K}_4\text{Fe}(\text{CN})_6$, giving characteristic crystals of $\text{Cu}_2\text{Fe}(\text{CN})_6 \cdot \text{NH}_3 \cdot \text{H}_2\text{O}$ with 0.00015 mg. of Cu.

J. S. A.

[Polarographic] determination of copper, nickel, and cobalt in steels.—See B., 1937, 921.

Rapid photometric determination of copper and nickel in steels.—See B., 1937, 921.

Determination of copper in foods.—See B., 1937, 975.

Molecular spectra and spectroscopic analysis. V. Detection of gadolinium. VI. Detection of

samarium. G. PICCARDI (Atti R. Accad. Lincei, 1937, [vi], 25, 44—46, 86—87; cf. A., 1933, 1102).—V. The mol. emission spectrum of GdO is described and some new bands are recorded. The method can be used to detect $<0.05\%$ of Gd_2O_3 in solution.

VI. The spectrum of SaO in the range 4300—6700 Å. is described. The detection of Sa is somewhat less sensitive than that of Gd. O. J. W.

Determination of aluminium by precipitation with carbamide. H. H. WILLARD and N. K. TANG (Ind. Eng. Chem. [Anal.], 1937, 9, 357—363).—Al is pptd. quantitatively at p_H 6.5—7.5 in boiling solutions of its salts containing $\text{CO}(\text{NH}_2)_2$, NH_4Cl , and $(\text{NH}_4)_2\text{SO}_4$. If $(\text{NH}_4)_2\text{SO}_4$ is replaced by succinic acid the pptn. is quant. at p_H 4.2—4.6. A single pptn. gives effective separation from relatively large amounts of Ca, Mg, Mn, Ni, Co, Zn, and Cu. E. S. H.

Determination of aluminium in presence of fluorine compounds by means of hydroxyquinoline. K. A. VASILIEV (Zavod. Lab., 1937, 6, 432—434).—Pptn. of Al by 8-hydroxyquinoline is incomplete in presence of F⁻, which forms insol. salts of the type Na_3AlF_6 . Theoretical results are obtained by adding 0.14 g. of H_3BO_3 per mg. of F present.

R. T.

Determination of alumina in presence of metallic aluminium.—See B., 1937, 926.

Detection of traces of permanganate, persulphate, dichromate, and ferricyanide, present together. L. M. KULBERG (J. Appl. Chem. Russ., 1937, 10, 1130—1134).—Reduced phenolphthalein (I) is oxidised by MnO_4^- , $\text{S}_2\text{O}_8^{2-}$, and $\text{Fe}(\text{CN})_6^{3-}$, but not $\text{Cr}_2\text{O}_7^{2-}$. Should the solution give a coloration with (I), 1% NiSO_4 is added, the solution is filtered, and the ppt. is treated with NaOH and leuco-malachite-green (II) in 2% H_2SO_4 ; a green coloration indicates $\text{Fe}(\text{CN})_6^{3-}$. The filtrate gives a positive reaction with (I) in presence of MnO_4^- or $\text{S}_2\text{O}_8^{2-}$, in which case it is heated with EtOH-NaOH , filtered, and the residue is treated with (II); a green coloration indicates MnO_4^- . 0.1% H_2O_2 and 1% AcOH are added to the filtrate, and (I) is added after a few sec.; a red coloration is given by $\text{S}_2\text{O}_8^{2-}$. The reactions are adapted to detection of traces of any three ions in a solution of the fourth, and their sensitivity has been determined under such conditions.

R. T.

Use of sulphinic acids for determination of iron. J. V. DUBSKY, E. ORAVEC, and A. LANGER (Chem. Obzor, 1937, 12, 41—45).—These acids are not recommended for the gravimetric or volumetric determination of Fe^{3+} since results are not reproducible, or for testing with the micro-qual. spotting technique. F. R.

Use of the reaction between formaldehyde and alkali hydrogen sulphite in oxidimetry. Oxidimetric determination of iron. D. TSCHAVDAROV (Z. anal. Chem., 1937, 109, 396—402).—The solution of FeCl_3 or $\text{Fe}_2(\text{SO}_4)_3$ is treated with HCl or H_2SO_4 , boiled, and treated with sulphite in a vessel closed by a valve. The solution is cooled and 35% CH_2O added. After 10—15 min. MnSO_4 and H_3PO_4 are added and the solution is titrated with KMnO_4 .

excess of SO_2 having been removed by the CH_2O (which does not react with KMnO_4 in presence of sufficient MnSO_4). Cations are without influence, but NO_3^- is clearly deleterious, OAc^- hinders reduction, and PO_4^{3-} , present before reduction, gives FePO_4 . If no Cl^- is present 1–2 g. of NH_4Cl must be added before reduction, and solutions of unknown acidity must first be treated with slight excess of aq. NH_3 followed by 8–10 c.c. of 2N-HCl. The method with $\text{K}_2\text{Cr}_2\text{O}_7$ using NHPh_2 is similar. R. S. B.

Thiocyanate reaction for iron. T. N. KARSKAJA (Trud. Inst. Tschist. Chim. Reakt., 1937, No. 14, 81–87).—The reaction with CNS $^-$ serves for detection of Fe in sol. alkali, alkaline-earth, and Mn chlorides, nitrates, and sulphates, but not in Pb, Hg, Cd, and Zn salts. R. T.

Ferric thiocyanate equilibria. R. DuBois (J. Chem. Educ., 1937, 14, 324–326).—The decolorising effect of the addition of NH_4Cl on the red colour produced when NH_4CNS is added to aq. FeCl_3 is not a valid illustration of the law of mass action. It is due primarily to the addition of charged ions (salt effect), and an equiv. effect is produced by solutions of NH_4Cl , NH_4NO_3 , NaCl , and NaNO_3 of the same concn. At low concns. the salt effect in the reaction $\text{Fe}^{3+} + 6\text{CNS}^- \rightleftharpoons \text{Fe}(\text{CNS})_6^{3-}$ is positive, i.e., with increasing salt concn., the apparent dissociation of the coloured complex is increased. The salt effect is important at low concns., and is the more pronounced the higher is the valency type, since the relative magnitudes of the decolorising effect of equimol. concns. of KCl , K_2SO_4 , MgCl_2 , AlCl_3 , and H_3PO_4 on 0.00375M solutions of Fe^{III} thiocyanate are in the order of the ionic strengths of the solutions. The decolorising action of the higher valency type salts is pronounced at a concn. 0.01M and increases rapidly. The effects of HCl and H_2SO_4 are < those of KCl and K_2SO_4 , the difference being attributed to the reversal of the hydrolysis of Fe^{3+} by H^+ . Chloride solutions have a decolorising effect which is slightly > that of the corresponding nitrates, possibly on account of the formation of FeCl_4^{3-} . L. S. T.

Dimethylglyoxime as an indicator in volumetric analysis. [Determination of ferrous iron.] K. KOMÁREK (Coll. Czech. Chem. Comm., 1937, 9, 247–253).—When aq. $\text{K}_3\text{Fe}(\text{CN})_6$ is added to conc. aq. Fe^{2+} containing a little NH_3 , much Rochelle salt, and dimethylglyoxime as indicator, the colour change red to yellowish-green occurs when all but about 2% of the Fe^{2+} has reacted thus: $\text{Fe}(\text{CN})_6^{4-} + \text{Fe}^{2+} = \text{Fe}(\text{CN})_6^{3-} + \text{Fe}^{3+}$. J. G. A. G.

Spectrographic determination of alloying constituents in steels.—See B., 1937, 921.

Organic reagents in analytical chemistry. XI. Cobalt. J. V. DUBSKY and A. LANGER (Chem. Obzor, 1937, 12, 8).—In neutral or alkaline media 1 : 2- (I) and 2 : 1- $\text{NO}\cdot\text{C}_{10}\text{H}_6\cdot\text{OH}$ give reddish coloured ppts. of complex salts, insol. in dil. mineral acids, with Co^{2+} and Co^{3+} salts. Conditions for the determination of Co with (I) as $[\text{C}_{10}\text{H}_6(\text{NO})\cdot\text{O}]_3\text{Co}\cdot 2\text{H}_2\text{O}$ are given. These reactions are evidence for the existence of the nitrosonaphthols in two tautomeric forms. F. R.

Polarographic determination of molybdate and phosphate ions. F. A. UHL (Z. anal. Chem., 1937, 110, 102–117).— MoO_4^{2-} , in presence of lactic acid, gives a polarographic step which is independent of the acid concn. The molybdate solution, containing HNO_3 , is treated with a 1.5M- $\text{K}_2\text{C}_2\text{O}_4$ + M-KCl solution, and neutralised (bromothymol-blue). 10 c.c. of 2N-lactic acid are added, and then 2N- HNO_3 , and the solution is polarographed. For the determination of PO_4^{3-} , a measured excess of MoO_4^{2-} is added, and the excess is determined polarographically. J. S. A.

Arsenate method for determination of zirconium. W. C. SCHUMB and E. J. NOLAN (Ind. Eng. Chem. [Anal.], 1937, 9, 371–373).—The conditions for quant. pptn. of $\text{Zr}_3(\text{AsO}_4)_4$ by adding $(\text{NH}_4)_3\text{AsO}_4$ to ZrOCl_2 in aq. HCl have been determined. The interference of Ce^{IV} is eliminated by double pptn.; if Ti is present, a correction must be applied. The ppt. is ignited directly to ZrO_2 under reducing conditions. E. S. H.

Peroxide method for [determination of] vanadium. Spectrophotometric study. E. R. WRIGHT [with M. G. MELLON] (Ind. Eng. Chem. [Anal.], 1937, 9, 375–376).—The optimal conditions for the determination have been investigated spectrophotometrically. The recommended concn. of H_2SO_4 , HNO_3 , or HCl is 0.6–6N, and the solutions should contain 0.5–3 c.c. of 3% H_2O_2 per 100 c.c. The limiting concns. of interfering ions have been determined. E. S. H.

Micro-determination of gold. W. B. POLLARD (Analyst, 1937, 62, 597–603; cf. B., 1932, 511).—Pptd. Au is dissolved in aq. Br-HCl and titrated as described previously, except that *o*-dianisidine is substituted for *o*-tolidine as a reducing agent. Solutions of Au in aqua regia are freed from NOCl by passing a current of air over the surface. Interfering metals are removed by pptn. of the Au with a reducing agent, filtering in a special micro-filter, and dissolving and titrating as above. For pptn. of Au in presence of Pd, "metol" or *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ is recommended. Cu, Ag, Fe, Ni, Zn, Cd, Al, and Sn do not interfere in the titration, but Pb interferes unless the solution in aqua regia is diluted with H_2O . Minute quantities of Au are "collected" by co-pptn. with Te. In this way 0.01–0.10 mg. of added Au was quantitatively recovered from 10 litres of tap H_2O . E. C. S.

Separation of gold from tellurium and selenium. J. SEATH and F. E. BEAMISH (Ind. Eng. Chem. [Anal.], 1937, 9, 373–374).—Quinol ppts. Au quantitatively in presence of Te and Se. The filtrate can be analysed for Te and Se by the usual procedure. E. S. H.

Electric heating apparatus. F. BREUER (Ind. Eng. Chem. [Anal.], 1937, 9, 363).—The apparatus is designed for heating volatile solvents for reflux or distillation. E. S. H.

Electric heater for a water still. F. R. PRATT (Rev. Sci. Instr., 1937, [ii], 8, 286–287).—In the heater described, used for operating a small multiple still, the H_2O to be heated serves, instead of resistance coils, as the resistance element. N. M. B.

M.p. bath. H. P. BROWN (J. Chem. Educ., 1937, 14, 380).— $\text{C}_6\text{H}_4(\text{CO}_2\text{Bu})_2$ can, with advantage, replace H_2SO_4 . In a Thiele tube or similar device exposing a small area of liquid surface in a relatively tall container, m.p. up to 300° can be taken with safety. L. S. T.

Detection of f.p. by dielectric measurements. L. T. ALEXANDER, T. M. SHAW, and R. J. MUCKENHIRN (Proc. Soil Sci. Soc. Amer., 1936, 1, 113—119).—The material to be investigated forms a condenser in a tuned radio-frequency circuit with a vac.-tube voltmeter. Variations in ϵ are compensated by a calibrated variable condenser. The material is immersed in a refrigerated const.-temp. bath and the temp. varied from -20° to room temp. ϵ is plotted against temp. and the f.p. depression read. The results are more accurate than those given by the Beckmann technique. A. M.

Apparatus for the determination of the elevation of the b.p. in hydrogen fluoride. W. KLATT (Z. anorg. Chem., 1937, 233, 307—312).—Improved apparatus is described. F. J. G.

Constant-temperature bath for molecular stills. O. A. NELSON and H. L. HALLER (Ind. Eng. Chem. [Anal.], 1937, 9, 402).—Two forms of apparatus are described. E. S. H.

Thermocouple. R. C. MASON (Rev. Sci. Instr., 1937, [ii], 8, 265).—Thermocouples with elements of W-Kovar (Co-Ni-Fe alloy) can be sealed through glass, are not attacked by Hg, and are of high thermoelectric power. N. M. B.

Alternating current bridge in laboratory temperature control. M. BENEDICT (Rev. Sci. Instr., 1937, [ii], 8, 252—254).—A simple portable circuit with amplifier for continuous temp. control of furnaces and thermostats to within 0.03° per hr. is described. N. M. B.

Thermo-regulator. P. GESTEAU (J. Pharm. Chim., 1937, [viii], 26, 105—111).—In the thermostat described the regulator consists of a tube of Hg, the expansion of which controls the phase difference between the grids and anodes of two thyatron valves, and thus determines the anode currents of the latter which operate the heating elements. A temp. const. to about 0.01° is thus conveniently obtained. W. O. K.

Succinic acid as a secondary standard for the calibration of combustion bombs. W. A. ROTH and G. BECKER (Z. physikal. Chem., 1937, 179, 450—456).—This acid is a trustworthy secondary standard, the heat of combustion for isothermal combustion at 20° and const. vol. being $3025.7 \text{ g.-cal.}_{18}$ per g. (reduced to vac.). R. C.

Calorimetric investigations of organic reactions. I. Apparatus and method. Inversion of sucrose and decomposition of diacetone alcohol. J. M. STURTEVANT (J. Amer. Chem. Soc., 1937, 59, 1528—1537).—Apparatus and technique for determining the velocities and heats of slow reactions with an accuracy of about 2% are described. Investigation of the inversion of sucrose by this means confirms that the reaction is strictly unimol. Determinations of the velocity of decomp. of diacetone

alcohol are in agreement with those of French (A., 1930, 42) and Murphy (A., 1931, 573). E. S. H.

Objective spectral colorimeter. E. LANDT and H. HIRSCHMÜLLER (Z. Wirts. Zuckerind., 1937, 87, 449—460).—Monochromatic light of λ 436, 546, or 578 m μ . traverses one or other of two twin glass cells containing the liquids to be compared (e.g., solvent and solution), and its intensity is measured by means of a photo-electric cell of Se barrier-layer type, the current from which is read on the 20-cm. scale of a Lange multiflex galvanometer. The instrument (Schmidt & Haensch) is convenient in use and of high precision; over the range of extinction coeffs. 0.1—1, results are reproducible to within 0.5% of the mean val. J. H. L.

Preparation of colour filters. V. A. SUCHICH and T. B. PERELMAN (Zavod. Lab., 1937, 6, 738—739).—The filters are prepared by spraying dye solutions on to glass surfaces. R. T.

Physical basis of colour measurement. A. C. HARDY (J. Appl. Physics, 1937, 8, 233—238).—A general survey of the interpretation of colour and of the use and scope of the spectrophotometer and colorimeters. N. M. B.

Application of the Pestemer polarisation photometer in photographic absorption spectrophotometry. G. SCHMIDT (Z. Elektrochem., 1937, 43, 690).—See this vol., 152. J. W. S.

Measurement of the angular region of reflexion of X-rays in polycrystalline substances by a new statistical method. A. REIS (Compt. rend., 1937, 205, 369—371).—Two Debye-Scherrer spectrograms are photographed on the same film, the orientation of the specimen being varied to a small known extent between the exposures. The variation in the no. of spots on the resulting photographs with change in orientation permits the determination of the mean region of angular reflexion. J. W. S.

Determination of orientation of crystallites in fibrous substances. R. HOSEMANN (Z. physikal. Chem., 1937, 179, 356—360).—A photometric method of measuring the degree of orientation of the crystallites is described. R. C.

Globar support for infra-red spectrometry. L. G. BONNER (Rev. Sci. Instr., 1937, [ii], 8, 264—265).—Electrical contact with the carborundum rod (globar) radiation source is effected by Ag soldering into hollows in thick Cu rod fitted with radiating fins. N. M. B.

Collapsible X-ray tube and vacuum table for structural and spectral analysis. V. A. ZUKERMAN (Zavod. Lab., 1937, 6, 465—470).—Apparatus is described. R. T.

X-Ray double spectrometer with stationary source and ion chamber. P. KIRKPATRICK and P. A. ROSS (Physical Rev., 1936, [ii], 49, 209).—An experimental arrangement is described. L. S. T.

Rotating spark contact for comparative spectroscopy. S. VAN DER LINGEN (S. African J. Sci., 1937, 33, 197—198).—Two spark gaps, operated by a rotating contact, are projected on to the spectrometer slit so as to overlap. H. J. E.

Stereoscopic photomicrography. S. SHIMADZU (Mem. Coll. Sci. Kyoto, 1937, A, 20, 1—2).—A simple method of taking stereoscopic photomicrographs by inclining the object on both sides of the optical axis of an ordinary microscope is described.

N. M. B.

High dispersion linear scale mass spectrograph with velocity and direction focussing. K. T. BAINBRIDGE and E. B. JORDAN (Physical Rev., 1936, [ii], 49, 421).—High resolving power, sensitivity, and dispersion have been combined in a spectrograph for the investigation of isotopes.

L. S. T.

Refractometer for the near infra-red. R. KINGSLAKE and (Miss) H. G. CONRADY (J. Opt. Soc. Amer., 1937, 27, 257—262).—The apparatus for measuring n on a 60° prism is essentially a double Wadsworth mirror monochromator, the first half calibrated in λ , and the second to read angular rotations of the table carrying the unknown prism. Measurements for $0.365\text{--}2\mu$. on 11 optical glasses are tabulated.

N. M. B.

Objective photometry. P. KRUMHOLZ (Mikrochim. Acta, 1937, 1, 205—211).—A photo-electric photometer using 5 c.c. of solution is described. The instrument may be used for kinetic measurements on colour reactions.

J. S. A.

Universal nephelometer with selenium photoelements. B. E. SEMEIKIN (Zavod. Lab., 1937, 6, 736—738).—Apparatus is described.

R. T.

Photo-electric comparator. R. ROURE, L. QUEVRON, and R. GENSE (Compt. rend., 1937, 205, 131—133).—Objects to be measured are placed between two parallel plane surfaces; one is fixed, movement of the other changing the effective aperture of a photo-cell. Sensitivity to at least 0.1μ . is claimed.

A. J. E. W.

Photo-electric determination of extinction coefficients of solutions. A. FUJITA and T. SAKAMOTO (J. Biochem. Japan, 1937, 25, 193—205).—The use of a photo-cell and valve amplifier, applicable to a λ range of $190\text{--}730\text{ m}\mu$., is described.

F. O. H.

Use of photo-elements with blocking layer for radioactive measurements. P. BONET-MAURY (Compt. rend., 1937, 204, 1641—1643).—Se cells with a layer of CuO give rise to a p.d. when irradiated by α - and β - but not γ -rays, as for photons. The study of radioactive rays, with and without the use of ZnS screens, is described, and the effects of α -rays and photons are compared.

R. S. B.

Copper sulphide photo-cell. J. J. BRADY and W. F. SPRENGNETH, jun. (Physical Rev., 1936, [ii], 49, 420).—In the cell described the amount of S used to form sulphide is controlled by a mol. beam. The sulphide is formed by depositing S atoms on a Cu plate heated by electronic bombardment in a high vac.

L. S. T.

Series of filters for the quartz mercury lamp. C. WINTHER (Z. Elektrochem., 1937, 43, 691—695).—Instructions are given for the prep. of solutions for use in filters to transmit characteristic frequencies of the Hg lamp, but with low transmission for other frequencies.

J. W. S.

Collodion filter for $K\alpha$ chromium radiation. S. S. SIDHU (Rev. Sci. Instr., 1937, [ii], 8, 308).—The prep. of collodion filters of NH_4VO_3 is described.

N. M. B.

Breaking arc with high-frequency ignition. K. PFEILSTICKER (Z. Elektrochem., 1937, 43, 719—721).—A new form of the Gerlach breaking arc, for use in spectral analysis, is described; ignition is carried out by a separate high-frequency circuit. A modified form of interrupter is also described. The method is claimed to avoid mechanical vibration of the electrodes and scattering of substances under analysis.

J. W. S.

Use of the glass electrode without valve amplification. J. F. KEFFORD and A. L. G. REES (J. Proc. Austral. Chem. Inst., 1937, 4, 269—270).—The glass electrode with an ordinary galvanometer-potentiometer circuit permits determination of p_{H} vals. to ± 0.05 . Thorough insulation of the cell parts and galvanometer leads, e.g., with paraffin blocks, is necessary to prevent leakage currents. The glass electrode rapidly develops an asymmetry potential in alkaline solutions containing Na^+ , and requires frequent recalibration.

J. W. S.

Electrometric determination of p_{H} of media of high viscosity. F. A. SANTALOV (Zavod. Lab., 1937, 6, 760—761).—The p_{H} of liquids of high η is conveniently determined in a Leman H_2 micro-electrode chamber.

R. T.

Air-turbine stirrer for electrolysis and electro-titration. N. J. CHLOPIN (Zavod. Lab., 1937, 6, 768).—An air turbine is described.

R. T.

Proportional (Geiger-Klemperer) counter. G. BRUBAKER and E. POLLARD (Rev. Sci. Instr., 1937, [ii], 8, 254—258).—Investigations with H_2 , N_2 , air, CH_4 , CO_2 , O_2 , A, He, and BF_3 in a wire form counter show that the linearity of response across the counter opening varies markedly with the nature and pressure of the gas, being very poor for gases which readily form negative ions and improving for almost all gases as the pressure is reduced. A qual. explanation in terms of formation of negative ions is given.

N. M. B.

Torch ion counter. A. PROKOFIEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 41—43).—When the torch-like effluence produced on the circuit conductor of a short-wave generator, described by Zilitin-kevitsch, is quenched by applying a sufficient p.d. between plates placed on each side of the conductor, which for this purpose is made to end in a sphere of 2 mm. radius, stray ions in the space between the plates produce flashes on the sphere, so that the apparatus can act as an ion counter. It gave, in a comparative test, results similar to those obtained with a Geiger-Muller counter, when exposed to a 0.078 mg. Ra prep., but was somewhat less sensitive. It will detect slow ions, e.g., those produced by passing a flame in front of the sphere, as well as fast ones.

R. C. M.

Compensating circuit for blocking-layer photo-electric cells. B. A. BRICE (Rev. Sci. Instr., 1937, [ii], 8, 279—285).—The circuit, consisting of two blocking-layer cells in parallel with a galvano-

meter and potentiometer-rheostat, and its performance under different conditions are described.

N. M. B.

High potential apparatus for nuclear disintegration experiments. H. R. CRANE (Physical Rev., 1937, [ii], 52, 11—17).—A 10⁶-volt transformer and vac. tube giving a focussed ion beam of 250 μ a. at the target are described. The operation of cloud chambers is synchronised with 0.5 sec. energisation of the ion source and transformers.

N. M. B.

Alternating current arc source for the Zeeman effect. L. LIEBERMAN and G. S. MONK (Rev. Sci. Instr., 1937, [ii], 8, 263—264).—An a.c. arc perpendicular to the field obviates many disadvantages of a parallel d.c. arc.

N. M. B.

Mechanical method for computing the energy values to be associated with a fork in a cloud chamber caused by disintegration of a nucleus by a neutron. F. N. D. KURIE and J. J. LIVINGOOD (Physical Rev., 1936, [ii], 49, 208).—The device reduces the time needed for a complete analysis of a disintegration fork to a few min.

L. S. T.

Separation of isotopes. J. BERNAMONT and M. MAGAT (Compt. rend., 1937, 205, 367—368).—An intense pencil of positive ions produced at low potential is accelerated by a d.c. potential into a space between two plates, perpendicular to the pencil, between which an a.c. potential is applied. The magnitude and frequency of the latter are adjusted until one at. species leaves the a.c. field at the velocity of entry, whilst the other is alternately accelerated and retarded. An electrode opposite the outlet at a potential lower than the accelerating potential then collects only the accelerated ions.

J. W. S.

Continuously sensitive cloud chamber. A. LANGSDORF, jun. (Physical Rev., 1936, [ii], 49, 422).—A chamber designed to overcome certain difficulties inherent in the Wilson expansion chamber is described.

L. S. T.

Magnetic electron microscope. J. H. McMILLEN and G. H. SCOTT (Rev. Sci. Instr., 1937, [ii], 8, 288—290).—A simple one-stage 50 diameters max. magnification instrument with fluorescent screen image formed by thermionic emission from surfaces with small current yield is described.

N. M. B.

Electron diffraction apparatus and its application to the determination of the internal potential of ionic crystal lattices. P. A. THIESSEN and T. SCHOON (Z. physikal. Chem., 1937, B, 36, 195—215).—An apparatus for electron diffraction measurements with solids is described; in investigations of lattice structure it is capable of a precision approaching that of normal X-ray methods. Measurements of the diffraction spectra of KCl have been used to determine the internal potential, Φ . The form of the graph of Φ against the order of the interference points to a contraction of the lattice distances in the outermost lattice planes in the sense of Lennard-Jones and Dent's theory (A., 1929, 17).

R. C.

Astatic magnetometer for measuring susceptibility. E. A. JOHNSON and W. F. STEINER (Rev. Sci. Instr., 1937, [ii], 8, 236—238).—A durable

instrument of adjustable sensitivity range 2×10^{-8} — 1×10^{-5} e.m.u. per scale division is described. The range covers almost any material, and data for 10 substances are tabulated.

N. M. B.

Capillary combustion unit for gas analysis apparatus. B. E. CHRISTENSEN and R. CARLTON (Ind. Eng. Chem. [Anal.], 1937, 9, 400—401).—Modified apparatus is described.

E. S. H.

Automatic pipette. I. LIN (J. Chinese Chem. Soc., 1937, 5, 230—231).—Into the suction tube of an ordinary pipette is fitted by means of a rubber sleeve a tube having its lower end at the mark. For delivery air is admitted by uncovering a hole lying above the mark.

R. C.

(A) Apparatus for direct titration of reduced solutions, without access of air. (B) Apparatus for reduction of solutions and their potentiometric titration. C. J. RABINOVITSCH and M. V. OZOLINA (Zavod. Lab., 1937, 6, 509—510, 510—511).—Apparatus is described.

R. T.

Apparatus for determination of traces of hydrogen sulphide in gases. N. KAMINSKI (Maslob. Shirn. Delo, 1937, No. 3, 32—33).—An iodometric method is described.

R. T.

Qualitative analyses and colorimetric estimates with the aid of Jena glass drop test plate. H. SCHAFER (Mikrochim. Acta, 1937, 1, 144—153).—With a transparent glass plate, drop reactions can be carried out against white or black backgrounds according to the coloration or ppt. concerned. By means of comparative tests with graded standard solutions, the tests can be made semi-quant.

J. S. A.

Instrument suspensions. L. WALDEN (J. Sci. Instr., 1937, 14, 257—268).—Details are given of the "shooting" of SiO₂ fibres, and of numerous processes, including the distillation of metals in a vac., whereby such fibres are given electrically conducting coatings. The manipulation of these fibres and metal filaments in instrument construction is described.

J. G. A. G.

Simple super-centrifuge for continuous treatment of liquids. E. J. JEFFERIES (J. Sci. Instr., 1937, 14, 282—284).—The air-driven spinning top has been developed into a centrifuge which treats 5 litres of fluid per hr. at 500—850 revs. per sec. in an Al rotor 1.5 in. in diameter.

J. G. A. G.

Enclosed apparatus for laboratory crystallisations. J. D. PIPER and N. A. KERSTEIN (Ind. Eng. Chem. [Anal.], 1937, 9, 403—404).

E. S. H.

Safety tube for use with a water pump. F. J. NELLENSTEYN (Chem. Weekblad, 1937, 34, 546).—The pump is attached to the lower end of a wide, sealed, vertical glass tube, which acts as a reservoir, fitted with a stopcock at the upper end for the release of the vac. when necessary, and a narrow glass tube, which passes through the wall at the lower end and ends inside and as near the upper end of the reservoir as possible. This glass tube is connected at its lower end, outside the reservoir, to the apparatus to be evacuated. Any H₂O sucked back from the

pump rises in the wide vertical tube to a higher level with no risk of its siphoning into the apparatus.

S. C.

Trap for use with oil diffusion pump. K. R. MORE, R. F. HUMPHREYS, and W. W. WATSON (Rev. Sci. Instr., 1937, [ii], 8, 263).—An efficient solid CO₂ trap to prevent oil vapour from diffusing back into the evacuated apparatus is described.

N. M. B.

Esparto pulp antiaerosol filters. Puncturing of antiaerosol filters by ageing tests with water vapour. Their subsequent regeneration. L. DAUTREBANDE, E. DUMOULIN, and P. ANGENOT (Compt. rend., 1937, 205, 156—158).—The filters were permeable to a methylene-blue (I) aerosol after 20 min. of treatment with humid air. Punctured filters can be rendered impermeable by treatment with a conc. (I) aerosol drawn through at a rapid rate.

A. J. E. W.

Esparto pulp antiaerosol filters. Influence of the relative humidity on the puncturing of antiaerosol filters. Influence of the time of passing of the humid atmosphere. L. DAUTREBANDE, P. ANGENOT, and E. DUMOULIN (Compt. rend., 1937, 205, 240—243).—The puncturing of the filters by damp air (cf. preceding abstract) occurs only with the R.H. >92% at room temp., and is independent of the duration of aspiration of the air. The resistance to puncturing decreases with increasing rates of aspiration.

A. J. E. W.

Modification of the Jaeger surface tension apparatus. S. VAN DER LINGEN (S. African J. Sci., 1937, 33, 203—204).—An apparatus which combines determinations by the capillary-ascent method and the Jaeger method is described.

H. J. E.

Methods of measurement of surface tension, and their application. K. F. SHIGATSCH (Zavod. Lab., 1937, 6, 699—709).—Known methods are described.

R. T.

Simple appliance for sedimentometric analysis. N. A. FIGUROVSKI (J. Appl. Chem. Russ., 1937, 10, 1142—1148).—The rate of sedimentation of suspensions or emulsions is derived from the change in position of a glass rod or balance pan suspended in the solution on a flexible glass rod.

R. T.

Improved chemical [laboratory] hood. E. C. BINGHAM (J. Chem. Educ., 1937, 14, 310—312).—Plans are reproduced.

L. S. T.

Automatic filtering set-up. D. H. WEST (J. Chem. Educ., 1937, 14, 395).

L. S. T.

Fractional vacuum distillation of solid substances. K. HAUSCHILD (Chem. Fabr., 1937, 10, 375).—A simple apparatus for collecting the distillate in portions without interrupting the distillation is described.

R. S. B.

Rationalisation of apparatus for the distillation method of determining water content of solids. A. G. BOGDANTSCHENKO (Zavod. Lab., 1937, 6, 762—763).—The Dean-Stark apparatus is recommended.

R. T.

Laboratory "double effect" [condenser]. P. BOURCET (Bull. Sci. Pharmacol., 1937, 44, 120—122).—A condenser for use in the distillation, under reduced pressure, of solutions inclined to frothing is described.

L. D. G.

Mercury manometer with high multiplication factor for differential pressure measurements. R. M. SUTTON (Physical Rev., 1936, [ii], 49, 414).

L. S. T.

Manganin resistance pressure gauge. L. H. ADAMS, R. W. GORANSON, and R. E. GIBSON (Rev. Sci. Instr., 1937, [ii], 8, 230—235).—Measurements were made of the effect of winding, heat-treatment, and pressure-seasoning on the resistance and pressure coeff. of various coils and the effect of temp. on the pressure coeff. of manganin was determined. Equations applicable to the fixed bridge method of measuring small resistance changes are given.

N. M. B.

Universal gas-pressure apparatus. S. VAN DER LINGEN (S. African J. Sci., 1937, 33, 193—196).—A students' apparatus for studying the gas laws and the behaviour of vapours is described.

H. J. E.

[Apparatus for] measurement of gas pressures.—See B., 1937, 855.

[Apparatus for] determination of particle size of powdered materials.—See B., 1937, 852.

Baumé hydrometer correction table for sodium hydroxide solutions. J. GRISWOLD (Ind. Eng. Chem. [Anal.], 1937, 9, 388).—The table includes a correction for temp. and for thermal expansion of the glass instrument.

E. S. H.

Semi-quantitative visual method for comparing electrolytic conductivities in lecture demonstrations. F. E. BROWN and W. G. BICKFORD (J. Chem. Educ., 1937, 14, 384—385).

L. S. T.

Geochemistry.

Variations in temperature of atmospheric ozone according to its origin. D. BARBIER, D. CHALONGE and E. VASSY (Compt. rend., 1937, 204, 1665—1667; cf. A., 1935, 561).—The temp. of the O₃ layer has been calc. from the absorption spectrum at 3100—3300 Å. For air of polar origin the temp. at the centre of gravity of the O₃ layer is > that for air of subtropical origin.

R. S. B.

Geology of the iron deposits in the lower Yangtze region. C. Y. HSIEH, C. C. SUN, Y. C. CHENG, and K. CHERN (Mem. Geol. Survey China, 1935, A, No. 13, 191 pp.).

CH. ABS. (e)

High iron tourmaline from the Marquette iron range. C. B. SLAWSON (Amer. Min., 1936, 21, 195).—Fe tourmaline is a characteristic mineral in the

quartz veins of this range. Chemical and optical data have been obtained for high-Fe tourmaline from the Champion Fe mine. L. S. T.

Weathering of igneous rocks. IV. Photochemical method of determining free iron oxide. MITURU HARADA (Bull. Agric. Chem. Soc. Japan, 1937, 13, 383—391; cf. *ibid.*, 1936, 12, 142).—Under the action of light, free Fe_2O_3 can be extracted from hæmatite and limonite by solutions less acid than those previously used. Recommended solutions are: for hæmatite, $\text{H}_2\text{C}_2\text{O}_4$ 0.025 and $\text{K}_2\text{C}_2\text{O}_4$ 0.025 g.-mol. per litre, and for limonite $\text{H}_2\text{C}_2\text{O}_4$ 0.005 and $\text{K}_2\text{C}_2\text{O}_4$ 0.015 g.-mol. per litre. The solutions are allowed to act on the finely powdered mineral for 8 hr. in sunlight or for 20 hr. at 10 cm. from a 100-watt metal-filament lamp. J. W. S.

Hydrothermal leaching of iron ores. S. ROYCE (Econ. Geol., 1937, 32, 389—392).—A criticism (cf. this vol., 382). L. S. T.

Theory of desilicification of granitic pegmatites. K. A. VLASOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 189—192).—The principal role in the desilicification is attributed to the action of HF, HBF_4 , and H_2SiF_6 on the Mg and Fe of basic and ultra-basic rocks. Hydrolysable products are thereby formed, the active material being regenerated and transmitted through the rock mass. Aq. H_2SiF_6 , HF, and MgSiF_6 heated at 250° under pressure in SiO_2 formed silicic acid, the amount being \propto the time of heating. J. S. A.

Pegmatites and hydrothermal veins. K. K. LANDES (Amer. Min., 1937, 22, 551—560).—A discussion. The important metals that may occur in commercial amounts in pegmatites are practically confined to Sn, W, and Mo. The pegmatite occurrences of these metals merge with typical hydrothermal veins. Granitic magmas produce pegmatites and these in turn produce hydrothermal solutions which may ppt. ores of these metals both in the pegmatite and in veins in the country rock. Intermediate magmas during their crystallisation pass through a minor pegmatite phase before entering the hydrothermal phase. During the latter Au, sulphides, and similar ore minerals are deposited mainly in hydrothermal veins in the overlying rocks. L. S. T.

Sphalerite from a pegmatite near Spruce Pine, N. Carolina. C. S. ROSS (Amer. Min., 1937, 22, 643—650).—Descriptive, with a chemical analysis. L. S. T.

Etch tests on calaverite, krennerite, and sylvanite. M. N. SHORT (Amer. Min., 1937, 22, 667—674).—The etching patterns obtained with HNO_3 of different concns. are illustrated. Other common etching reagents give no definite patterns. With HNO_3 , sylvanite can usually be distinguished from krennerite and calaverite. These two minerals, however, are difficult to differentiate from each other by this means. L. S. T.

Relationship between the structural and morphological elements of krennerite, calaverite, and sylvanite. G. TUNELL and C. J. KSANDA

(Amer. Min., 1936, 21, 203).—The Weissenberg X-ray goniometer reveals a close and simple relationship between the structural lattices of these minerals in spite of their different space-groups and unit cells. L. S. T.

Space-group and unit cell of sylvanite. G. TUNELL and C. J. KSANDA (Amer. Min., 1937, 22, 728—730).—X-Ray measurements give a_0 8.94, b_0 4.48, c_0 14.59 Å. (all ± 0.02 Å.), β $145^\circ 26' \pm 20'$, d_{calc} 8.17; probable space-group $P2/c - C_{2h}^2$. The unit cell contains 2AuAgTe_4 . L. S. T.

Paragenesis of cookeite and hydromuscovite associated with gold at Ogofau, Carmarthen-shire. A. BRAMMALL, J. G. C. LEECH, and F. A. BANNISTER (Min. Mag., 1937, 24, 507—520).—The ore-bodies are mainly sheet- and saddle-like masses of pyritic quartz with mispickel, blende, galena, etc., along bedding planes on the flank of an anticline in Lower Palaeozoic shales. Cookeite as finely scaly masses is monoclinic (pseudo-hexagonal) with a 5.13, b 8.93, c 28.30 Å., β near 90° ; the unit cell contains $4\text{LiAl}_3\text{Si}_3\text{AlO}_{10}(\text{OH})_8$. The silvery-white flakes of hydromuscovite have a 5.185, b 9.025, c sin β 20.20 Å., and the $(\text{OH})_8\text{K}_4$ group in muscovite here becomes $(\text{OH})_{8+m}\text{K}_{4-n}$. Detailed chemical analyses [by H. BENNETT] are given. L. J. S.

Age of the Great Bear Lake pitchblende. J. P. MARBLE (Amer. Min., 1937, 22, 564—566).—Analyses of the pitchblende- SiO_2 ore give the mean vals. Pb 5.877, U 29.386, Th (impure) <0.002 to $<0.011\%$, Pb/U 0.199, and the calc. age of the pitchblende 1368×10^6 years, in satisfactory agreement with the ages obtained from other samples (cf. A., 1936, 584) from different veins and levels. L. S. T.

Determination of the mineral composition of mine dust by means of X-rays. T. L. WALKER (Amer. Min., 1936, 21, 193).—A method for the determination of the amount of quartz in mine dust, accurate to within 5%, has been developed. A mixture of cryst. substances can also be quantitatively analysed. L. S. T.

Origin of oil as indicated by the composition of organic constituents of sediments. P. D. TRASK (U.S. Geol. Surv., 1937, Prof. Paper 186—H, 147—157).—Petroleum originates mainly from org. matter in marine sediments derived from plankton in overlying H_2O . The amount of org. material diminishes greatly before, and more slowly after, deposition and becomes more complex in composition as the sediment lithifies, owing to deficiency in O_2 of environment. Petroleum originates from complex proteins and non-nitrogenous matter rather than from cellulose, fats, and simple proteins. Liquid hydrocarbons when formed may dissolve other org. substances which may then interact. Repeated dissolution and subsequent reaction eventually lead to the formation of petroleum. H. C. R.

Geological description of the Kivdo-Raichichin brown coal deposit. A. T. PONOMARENKO (Razvedka Nedr., 1935, 5, No. 3, 10—15). CH. ABS. (e)

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

NOVEMBER, 1937.

Intensities of components of the Stark effect for hydrogen in strong electric fields. T. GUSTAFSON (Z. Physik, 1937, 106, 709—729).—The intensities of the components of the Stark effect for H_β are calc. to a first approximation. An intensity dissymmetry is indicated for the symmetrical violet and red components, the violet being the stronger. In the cases of the four strongest lines the intensity dissymmetry is between 5.6 and 10.7% for a field strength of 500 kv. per cm., but is less in the case of weaker lines. H. C. G.

Fine structure of α -lines of hydrogen and deuterium. R. C. WILLIAMS and R. C. GIBBS (Physical Rev., 1936, [ii], 49, 416).—The average interval between the two major components is approx. the same for both H and D, but approx. 0.01 cm.^{-1} < that predicted by theory. L. S. T.

Fine structure of D_α . M. HEYDEN (Z. Physik, 1937, 106, 499—517).—The fine structure of D_α obtained from discharge tubes under various conditions of tube width, c.d., and cooling with liquid air and H_2 was examined with a Fabry-Perot interferometer. The separation of the two strong components agrees to within 0.2% with Dirac's theory. Of the five transitions theoretically possible, three were obtained in every instance, and the fourth in six instances owing to its low intensity; the existence of the fifth was definitely established. H. C. G.

Molecular hydrogen of stellar atmospheres. M. NICOLET (Bull. Acad. roy. Belg., 1937, [v], 23, 574—581).—A crit. discussion of the methods of identifying mol. H_2 in stellar and solar spectra. F. J. L.

Effective cross-section for excitation of the Na- D lines by impact of sodium ions on helium. W. MAURER and K. MEHNERT (Z. Physik, 1937, 106, 453—457).— Na^+ radiation up to 20 kv. energy is impacted on He atoms and the resulting $\lambda\lambda$ 5890/96 and 5876 are photographed to the exclusion of the latter. The emission of Na- D lines is due to glow discharge and its intensity \propto pressure of He and current. The effective cross-sectional area for excitation is that for discharge alone. L. G. G.

Excitation of sodium hyperfine structure in a molecular beam. B. CARPENTER and R. A. FISHER (Physical Rev., 1937, [ii], 49, 417).—Using a mol. beam excited by high-frequency oscillations in A the separation observed for the two components of D_1 of Na is 0.062 cm.^{-1} and of D_2 , 0.057 cm.^{-1} . L. S. T.

Investigations of vacuum sparks by means of a high-speed rotating mirror. J. A. CHILES, jun. (Physical Rev., 1936, [ii], 49, 860).—Results obtained with vac. sparks between electrodes of Al, Bi, Cd, Cu, Pb, Mg, Pd, Sn, W, Zn, and graphite support the view that the discharge in high vac. between cold electrodes is initiated by field electron emission from the cathode. L. S. T.

Null method of estimating the half-life periods of metastable atomic states. W. LIPPERT (Ann. Physik, 1937, [v], 30, 136—150).—Experimental details and results for A and Ne are given. W. R. A.

Intensity ratios of the hyperfine structure components of the resonance lines of potassium. D. A. JACKSON and H. KUHN (Nature, 1937, 140, 276—277).—The magnetic moment of ^{39}K , deduced from these intensity ratios, is positive. In agreement with other investigators, the val. found for the spin is $3/2$. L. S. T.

Bergmann series of calcium. H. GRAFENBERGER (Ann. Physik, 1937, [v], 30, 267—283).— $\lambda\lambda$ accurate to $\pm 0.03\text{ \AA.}$ are recorded. Corrections to previous data are noted. Interferometer measurements of the fine structure of the first three members of the series have been made to $\pm 0.002\text{ \AA.}$ The 3F term of Ca I is shown to be a normal triplet term with no anomalies such as are observed for the D terms of Ca I and the F terms of Ba I. O. D. S.

Deep terms in Ti VI, V VII, Cr VIII, and Mn IX. S. G. WEISSBERG and P. G. KRUGER (Physical Rev., 1936, [ii], 49, 872—873; cf. A., 1936, 1309).— PP^0 multiplets and 2P — 2S lines are tabulated. L. S. T.

Extreme ultra-violet series in Cr VI, Mn VII, and Fe VIII. P. G. KRUGER and S. G. WEISSBERG (Physical Rev., 1937, [ii], 52, 314—317).—The spectra have been photographed with a 21-ft. grazing-incidence vac. spectrograph, and identifications and data for a large no. of lines are tabulated. The first member of the $3d^2D$ — nf^2F series of Cr VI has been found. Term vals. and effective quantum nos., and ionisation potentials of the isoelectronic sequence K I—Co IX are given. N. M. B.

Series spectra in Mn VII and Fe VIII. P. G. KRUGER and S. G. WEISSBERG (Physical Rev., 1936, [ii], 49, 873).—Lines in the extreme ultra-violet involving the $3d^2D$, $4p^2P$, $5s^2S$, $6s^2S$, and several nf^2F terms have been identified in the spectra of Mn VII and Fe VIII. Vals. of the $3d^2D_1$ term and the

corresponding ionisation potentials in the isoelectronic sequence K I—Co IX are tabulated. L. S. T.

Intensity measurements in the arc spectrum of copper. H. T. SMYTH (Physical Rev., 1936, [ii], 49, 872).—Intensity measurements have been made on Cu I lines in the region 3100—3700 Å.

L. S. T.

Spectrum of bromine. I. Structure of Br III. K. R. RAO and S. G. KRISHNAMURTY (Proc. Roy. Soc., 1937, A, 161, 38—48).—About 300 lines of the spectrum produced under different conditions of excitation are assigned to Br III. Deb's classification (A., 1930, 651) is regarded as incorrect and a new scheme, consisting of a system of quartets and doublets, is proposed. The ionisation potential of Br III is given as 35.7 v.

G. D. P.

Pressure shifts of krypton lines. H. MARGENAU and W. W. WATSON (Physical Rev., 1937, [ii], 52, 384—385).—A criticism of the calculations of Kuhn (cf. this vol., 486).

N. M. B.

Fine structure of absorption bands of tellurium. A. PRZEBORSKI (Acta phys. polon., 1934, 3, 527—536; Chem. Zentr., 1936, i, 3640).—Data are recorded for the bands at 4624—5528 Å. and moments of inertia are calc. for the normal and excited states of the Te₂ mol. On Rosen's assignment of band heads, the Te—Te distance $r_0 = 2.44$ Å.; on a new assumption $r_0 = 2.77$ Å.

J. S. A.

Isotopic effect in resonance series of Te₂. B. ROSEN and J. MAT (Bull. Acad. roy. Belg., 1937, [v], 23, 626—645).—The isotopic effect in the resonance series of Te₂ excited by $\lambda\lambda$ 4358 and 4046 Å. of Hg I and 4481 Å. of Mg II has been investigated. The formula of Rosen (A., 1927, 608) for calculation is superior to that of Olsson (cf. A., 1935, 905). The distribution of intensity in the isotopic multiplets is discussed.

F. J. L.

Hyperfine structure and nuclear moment of barium. A. BENSON and R. A. SAWYER (Physical Rev., 1936, [ii], 49, 867—868).—Examination of new and old data on the hyperfine structure of Ba I and Ba II lines shows that for ^{135, 137}Ba i is 3/2.

L. S. T.

Hyperfine structure interval rule as a means of classifying unidentified spectrum lines. H. E. WHITE (Physical Rev., 1936, [ii], 49, 872).—In the Pr spectrum the J vals. have been determined by means of the hyperfine structure patterns. For most of the lines studied in Co, La, and Pr the interval rule holds to within 2—3%.

L. S. T.

Influence of optical excitation energy on transitions involving the 2³P₀ level of mercury. G. A. ROSSELOT (Physical Rev., 1936, [ii], 49, 871—872).—Data for Hg vapour, mixed with N₂, and optically excited at room temp. by the radiation from quartz Hg arcs are recorded.

L. S. T.

Structure of the band spectrum of mercury vapour. III. S. MROZOWSKI (Z. Physik, 1937, 106, 458—562).—Corrections in the two potential curves B^{30-} and B^{31-} for the diat. Hg mol. discussed in previous work (this vol., 54) involve changes in the interpretation of the band spectrum of the Hg mol.

and in the mechanism of the fluorescence phenomena. These are discussed.

H. C. G.

Classification of the near infra-red spectrum of mercury. II. O. MASAKI and T. MORITA (J. Sci. Hiroshima Univ., 1937, A, 7, 305—313; cf. A., 1936, 1310).—Photographic data to 14,000 Å. are tabulated and classified. Corrections to Part I (*loc. cit.*) are noted.

O. D. S.

Quenching and depolarising collisions and polarisation of resonance radiation in a magnetic field. R. PETERSEN and A. ELLETT (Physical Rev., 1936, [ii], 49, 417).—Theoretical.

L. S. T.

Similar behaviour of negative glow in glow discharges to cathodic current source in arc discharge. G. MACIUC (Bull. Fac. Stiinte Cernauti, 1935, 9, 170—175; Chem. Zentr., 1936, i, 3649).—Similar behaviour is found at pressures of 1—5 mm.

J. S. A.

Effects of chemical combination on the widths and asymmetries of X-ray lines. H. H. ROSEBERRY and J. A. BEARDEN (Physical Rev., 1936, [ii], 49, 884—885).—Such effects have been observed for Ti, Cr, Mn, Fe, and Zn. α -lines were broadened 3—35%, β -lines 0—30%, and γ -lines none. No effect on the separation of the α -doublet was observed. In general, the asymmetries of the lines remained the same as that of the pure metal.

L. S. T.

Soft X-ray absorption of lithium and its halides. H. M. O'BRYAN (Physical Rev., 1936, [ii], 49, 879; cf. this vol., 217).—Absorption spectra of films $< 1 \mu$. thick of Li and its halides have been photographed over the region 170—700 Å. The bands show a width of 2—4.5 v. at the head with less intense continuous absorption extending to shorter $\lambda\lambda$. Band centres are recorded.

L. S. T.

Absorption measurements on medium velocity cathode rays and soft X-rays in oxygen. F. I. CALLISEN (Z. Physik, 1937, 107, 15—43).—Absorption coeffs. of photo-electrons produced in O₂ by the K α radiation of Fe, Ni, Cu, Zn, and Sn were measured by means of variation in pressure. Results are in accord with the diffusion theory of electron absorption. The X-ray mass absorption coeff. $\mu/\rho = 3.02\lambda^3 + 0.16$ in the range $1.4 < \lambda < 2.3$ Å.

L. G. G.

Fine structure of soft X-ray absorption edges. I. Lithium, magnesium, nickel, copper. H. B. SKINNER and J. E. JOHNSTON (Proc. Roy. Soc., 1937, A, 161, 420—440).—Methods for investigating the X-ray absorption edge fine structure of metals in the region 100—300 Å. are described. Details are given of Li K, Mg L₃, L₂, and L₁, Cu M_{2,3}, Ni M_{2,3}. The Li K edge in LiOH has been examined.

G. D. P.

Wave-lengths of K α X-ray satellite lines for elements S (16) to Ge (32). F. K. RICHTMYER and L. G. PARRATT (Physical Rev., 1936, [ii], 49, 644; cf. A., 1936, 1041; this vol., 55).

L. S. T.

Widths of K α X-ray satellite lines. L. G. PARRATT and F. K. RICHTMYER (Physical Rev., 1936, [ii], 49, 644—645; cf. preceding abstract).—A discussion.

L. S. T.

K emission spectra of gallium (31) and germanium (32). H. HULUBEI (Compt. rend., 1937, 205, 440—442).— $\lambda\lambda$ of the weaker lines are recorded and classified. A. J. E. W.

Absorption coefficients for aluminium, copper, and silver in the X-ray region from 13 to 24 Å. R. D. HILL (Proc. Roy. Soc., 1937, A, 161, 284—298).—A description of a vac. grating spectrograph for use in the long- λ X-ray region is given. Intensities are measured photographically and mass absorption coeffs. deduced for Al, Cu, and Ag for $\lambda\lambda$ 13.3, 14.6, 17.6, and 23.7 Å. G. D. P.

L emission bands of zinc, copper, nickel, and cobalt. J. FARINEAU (Nature, 1937, 140, 508).—Curves showing the intensity of the $L\alpha$ bands against e.v. are given. The observed bands represent transitions of both 3d- and 4s-electrons. L. S. T.

M emission bands of zinc, copper, and nickel. H. W. B. SKINNER and J. E. JOHNSTON (Nature, 1937, 140, 508—509).—The structures of the 3d- and 4s-electron bands are discussed in the light of observations on the M emission bands and the results of Farineau (cf. preceding abstract). L. S. T.

Intensity and structure changes of the $L\alpha$ emission lines of copper and iron on intense cooling of their anticathodes. K. PROSAD and A. T. MAITRA (Nature, 1937, 140, 464).—The intensity of the Cu $L\alpha$ line at the liquid O₂ temp. of the target is 70% of that from the target at room temp. The corresponding figure for Fe is approx. 60%. The L lines shift relatively to each other with the change in temp., and changes in the widths of the lines also are indicated. L. S. T.

$L\alpha$ satellites for some heavy elements and rare earths. (MLLE.) Y. CAUCHOIS (Compt. rend., 1937, 205, 519—521; cf. A., 1936, 1169).— $\lambda\lambda$ of a no. of satellites given by U, Th, Bi, Mg, Au, Pt, Re, Ta, Dy, Gd, and Sm are recorded, and a classification is given. A. J. E. W.

Widths of the L series X-ray lines and limit of Pb (82). R. E. SHRADER (Physical Rev., 1936, [ii], 49, 644).—The widths of certain of these lines have been measured. Calc. widths of M, N, and O levels are recorded. L. S. T.

Difference of dispersion and sharpness of lines of X-ray dispersion spectra on entrance or exit from the refracting medium. Refraction in thin films of glycerol on quartz. H. SEEMANN (Physikal. Z., 1937, 38, 683—688).—The sharpness of Mo K lines after refraction at quartz is very different according as the rays are entering or leaving the medium. A. J. M.

Surface ionisation of barium on tungsten. A. N. GUTHRIE (Physical Rev., 1936, [ii], 49, 868).—The positive ion current, produced by surface ionisation of Ba on W, which results when a mol. beam of Ba strikes a W filament becomes detectable near 1700° K., increases with filament temp. up to 2000° K., and then remains const. up to 2600° K. Between 2000° and 2600° K. the ionisation efficiency is ~ 100%. L. S. T.

Origin of the additional ionisation in the barrier layers of the higher atmosphere. J. JUILFS (Physikal. Z., 1937, 38, 691).—The additional ionisation produced at a barrier layer in the higher atm. was investigated by means of two ionisation chambers, one containing A, the other air. The effect in the former was > in the latter, indicating the existence of radioactive γ -radiation in these layers. A. J. M.

Ionisation in gases effected by alternating current. H. W. PAEHR (Z. Physik, 1937, 106, 730—750).—Under certain conditions ions produced in a gas by application of an alternating potential do not travel to the electrodes, but accumulate to form a space charge. A method for measurement of this ionisation is described and results for air, A, and Hg vapour are reported and discussed. H. C. G.

Energy distribution of photoelectrons from sodium. A. G. HILL and L. A. DUBRIDGE (Physical Rev., 1936, [ii], 49, 877).—Experimental curves over the range 2400—4350 Å. agree with the theoretical for $\lambda\lambda$ for the high-energy end of the curve where the Fermi function is the controlling factor. L. S. T.

Positive ion work function of molybdenum. H. J. GROVER (Physical Rev., 1936, [ii], 49, 878).—Measurements by means of the mass spectrograph of the positive ion currents as a function of temp. give a val. for the positive ion work function which is > any previously reported, and balances the cycle $\Phi_{+0} + \Phi_{-0} - V$ U, where V is the ionisation potential and U is the latent heat of condensation of neutral atoms. L. S. T.

(A) Influence of electron reflexion on photoelectric emission. (B) Hypotheses for photoelectric emission analysis. W. B. NOTTINGHAM (Physical Rev., 1936, [ii], 49, 646, 649). L. S. T.

Electron motion in a plasma. E. G. LINDER (Physical Rev., 1936, [ii], 49, 645—646).—Mathematical. L. S. T.

Investigation of the electron avalanche with the cloud chamber. H. RAETHER (Z. Physik, 1937, 107, 91—110).—The cumulative collision ionisation process (electron avalanche) initiated by one electron moving in a uniform electric field has been investigated with a modification of the cloud chamber. Measurements in air and H₂ are reported and the thermic energy of the electrons is calc. H. C. G.

Intensity of scattering of electrons as a function of angle. H. J. YEARIAN and J. D. HOWE (Physical Rev., 1936, [ii], 49, 417—418).—The curves for Cd are similar to those from Ag (cf. A., 1936, 1439). L. S. T.

Behaviour of a bundle of monokinetic electrons after penetrating an absorbing foil. J. J. TRILLAT and A. HAUTOT (Ann. Physik, 1937, [v], 30, 165—168).—The velocity of electrons which have passed through an absorbing foil remains unchanged if their original path is unaltered, but if the electrons in penetrating the foil undergo deviation their velocity is diminished. W. R. A.

Velocity distribution of secondary electrons produced by cathode rays in gases. F. FREY

(Ann. Physik, 1937, [v], 30, 297—312).—The velocity distribution of secondary electrons produced in air by cathode rays up to 500 v. velocity has been investigated. To a first approximation the distribution is independent of the primary velocity. The majority of secondary electrons have velocities <10 v. The influence of gas pressure and construction of the apparatus and of stray primary electrons are discussed. Observed velocities are < those obtained by Ishimo for primary energies 7000—14,500 v. (Phil. Mag., 1916, 32, 202). The velocity distribution is similar to that for secondary electrons from Cu (cf. Gehrts, Ann. Physik, 1911, 36, 1009) and from Pt (cf. Becker, *ibid.*, 1925, 78, 247).

O. D. S.

Distribution of secondary electrons liberated from an aluminium gauze. C. HAGEN and M. SANDHAGEN (Z. Physik, 1937, 107, 132—137).—Measurements of the intensity and distribution of the stream of secondary electrons liberated by a primary electron beam impinging on an Al gauze of fine mesh are reported.

H. C. G.

Magnetic spectrum of positrons generated in silver and lead by γ -rays from radium-C. G. L. LOCHER and C. L. HAINES (Physical Rev., 1936, [ii], 49, 641).—Comparison of spectrograms with Ag and Pb as positron-generating elements and γ -ray sources of 80% Ms-Th₁ + 20% Ra, and Ra alone, shows (i) that the upper energy limit of the positrons is the same for both sources and lies between 1.11 and 1.115 m.e.v., indicating that the limit previously ascribed to Th-C'' γ -rays (this vol., 488) is due to the Ra contamination of the Ms-Th₁ source, (ii) the energy limit for Pb and Ag is the same with either γ -ray source, and (iii) with Ag, but not with Pb, intermediate lines appear. No correlation between positron lines from Ag and known γ -ray lines from Ra-C has been found.

L. S. T.

Widths of nuclear resonance levels and the calibration of ion-beam energies. L. R. HAFSTAD, N. P. HEYDENBURG, and M. A. TUVE (Physical Rev., 1936, [ii], 49, 866).

L. S. T.

Diffraction of slow positive ions. A. G. EMSLIE (Nature, 1937, 140, 463).—Photographs showing the scattering of Li ions by a jet of Na vapour and by a red-hot Ni target (at grazing angle) are reproduced. An explanation of the results, which seems to establish the wave nature of Li ions, is discussed.

L. S. T.

Negative ions in oxygen and hydrogen. O. LUHR and C. T. MALE, jun. (Physical Rev., 1936, [ii], 49, 860).—The nature of negative ions formed by electron attachment with subsequent ageing in H₂, O₂, and H₂-O₂ mixture has been investigated. A wide variety of newly-formed ions, ranging from H⁻ to complex ions of mol. wt. >100, has been found in H₂. In relatively pure O₂, the ions O⁻, H₂O₂⁻, O₃⁻, and O₄⁻ appear to be formed.

L. S. T.

Doppler effect in canal rays. B. VENKATESACHAR (Current Sci., 1937, 6, 51—52).—A review.

Electron scattering in helium. M. GOODRICH (Physical Rev., 1937, [ii], 52, 259—266).—Angular distribution curves for total and for elastic scattering,

obtained by investigations with a special scattering apparatus, of 100-v. incident electrons, and curves for scattering with various energy losses are discussed and compared with theoretical predictions.

N. M. B.

Limits of validity of the resonance principle of charge transfer. F. WOLF (Ann. Physik, 1937, [v], 30, 313—332; cf. this vol., 274).—The variation with ionic velocity of the charge-transfer cross-section for the processes N₂⁺ → Ne, N⁺ Ne, N₂⁺ → He, He⁺ → Ne, Ne⁺ → N₂, He⁺ → N₂ has been measured. From these and earlier results it is concluded that the resonance principle of Kallmann and Rosen is, except for some individual deviations, obeyed at ionic energies > the resonance energy. At ionic energies > resonance energy large vals. of ionisation are obtained, in contradiction to the principle.

O. D. S.

Determination of the at. wts. of lithium, potassium, and rubidium from isotope abundance measurements. A. K. BREWER (Physical Rev., 1936, [ii], 49, 867).—The abundance ratios, estimated from positive thermions emitted from Pt discs impregnated with the alkali, are ⁷Li: ⁶Li 11.60 ± 0.06, ³⁹K: ⁴¹K 14.20 ± 0.003, and ⁸⁵Rb: ⁸⁷Rb 2.59 ± 0.01. The Li ratio corr. for an isotope effect is 12.52; K and Rb showed no such effect. The at. wts. calc. from these ratios and the most probable vals. for the packing fractions are Li 6.939, K 39.094, and Rb 85.46.

L. S. T.

Search for the isotopes of hydrogen and helium of mass 3. (LORD) RUTHERFORD (Nature, 1937, 140, 303—305).—A review.

L. S. T.

Mass ratio of the carbon isotopes from the spectrum of CN. F. A. JENKINS and D. E. WOOLDRIDGE (Physical Rev., 1936, [ii], 49, 882).—measurements on the 0, 0 and 0, 1 bands of ¹³C¹⁴N give 13.0089 as a preliminary val. for ¹³C (limit of error 0.0005), using 12.0035 for ¹²C.

L. S. T.

Mass-spectrographic determination of mass changes in some carbon transmutations. K. T. BAINBRIDGE and E. B. JORDAN (Physical Rev., 1936, [ii], 49, 883).—New vals. for the mass differences of the matched doublets ¹²C + ¹H—¹³C and ¹H₂—²D are 4.5 ± 0.1 and 1.53 ± 0.04 × 10⁻³ unit, respectively. The ¹²C + ¹H—¹³C separation gives 3.6 m.v. energy available for the γ -ray, positron, and neutrino in the radiative capture of a proton by ¹²C and the subsequent disintegration of ¹³N. Using both doublet separations, the energy of the proton and recoil nucleus in the reaction ¹²C + ²H → ¹³C + ¹H is 2.76 m.v., in agreement with the disintegration figure. These measurements prove that in the C + proton and deuteron reactions involving the transmutation of ¹²C to ¹³C there is insufficient energy for a 3.5—4 m.v. γ -ray in addition to the known products and their energies.

L. S. T.

Mass-spectrographic measurement of the mass separation of certain doublets. E. B. JORDAN and K. T. BAINBRIDGE (Physical Rev., 1936, [ii], 49, 883).—Comparison of the O—CH₄ and the N—CH₂ doublets in a large no. of spectra gives for the mass differences CH₄—O and CH₂—N the vals.

0.0369 \pm 0.0002 and 0.0130 \pm 0.0002, respectively, in good agreement with the vals. obtained from disintegration experiments. L. S. T.

Radioactivity of potassium and geological time. A. K. BREWER (Science, 1937, **86**, 198—199).—Taking into account the fact that the radioactivity of K is confined largely to ^{40}K , and using the most recent vals. for the half-life and disintegration const., it is calc. that the upper limit for the age of the earth is slightly $<3 \times 10^9$ years. The ratios of the amount of ^{40}K present at various geological ages to that now in existence are recorded. L. S. T.

Extreme intervals between radioactive emissions. E. J. GUMBEL (J. Phys. Radium, 1937, [vii], **8**, 321—329).—Theoretical. The mean interval between consecutive emissions is calc., and the distribution of the *m*th interval and its characteristics are established. F. J. L.

Characteristic α -ray tracks in infected photographic emulsions. T. R. WILKINS (Physical Rev., 1936, [ii], **49**, 639).—When special emulsions are infected with drops of solutions of Ra and its products or with Th active deposit, the α -rays corresponding with the remaining members of the two series leave tracks which, in the developed plates, appear as rows of grains proportional in no. to the air ranges of the various α -rays. L. S. T.

Disintegration of aluminium by polonium α -particles. W. R. KANNE (Physical Rev., 1937, [ii], **52**, 266—270).—Using a Po source, the thick target absorption curve for the protons emitted by Al under α -particle bombardment was obtained. The structure of the groups observed and the interpretation of results agree with the investigations of Chadwick (cf. A., 1932, 318), but the ranges of the principal groups are in better accord with those found by Pose (cf. A., 1930, 1232). Discrepancies are discussed. An increase of proton yield with the height of the resonance levels is observed. The relative intensity of the short- and long-range groups is 4.0, and the difference in energy of any two corresponding groups is 2.4 m.e.v. N. M. B.

Materialisation of energy of β -rays. M. MONADJEMI (J. Phys. Radium, 1937, [vii], **8**, 347—352; cf. this vol., 389).—The no. of pairs produced in superficially equal masses of Cu and Al is of the same order of magnitude; the probability of materialisation $\propto Z$. The ratio, no. of positrons : no. of negatrons emitted by the radioactive source, is $2\text{--}3 \times 10^{-3}$ for RaBr₂ and $3\text{--}4 \times 10^{-3}$ for Th.B + C. F. J. L.

β -Ray spectrum of radium-E. J. S. O'CONNOR (Physical Rev., 1937, [ii], **52**, 303—314).—In view of widely varying available data, investigations were made with a magnetic spectrometer, with coincidence counting, for various conditions of source strength, mounting, and aperture of defining slits. Results indicate that the high-energy end-point val. depends on source strength and on the width of the defining slits. Data from all but very strong sources gave a Konopinski-Uhlenbeck plot, linear within the limits set by statistical fluctuations and finite slit widths.

The extrapolated high-energy end-point was 1.25 + 0.03 m.e.v. N. M. B.

β -Decay as due to a neutrino shower. N. S. N. NATH (Nature, 1937, **140**, 278—279).—The asymmetry in the curve showing the energy distribution of electrons in β -decay can be explained on the assumption that the final process consists of a shower of neutrinos, the no. in the shower being dependent on the transition energy of the nucleus. L. S. T.

Ionisation measurement of γ -radiation. G. W. C. KAYE and W. BINKS (Proc. Roy. Soc., 1937, A, **161**, 564—592).—An investigation undertaken to unify the measurement of γ -ray and X-ray dosage for therapeutic purposes. Difficulties encountered by other investigators have been overcome by the use of a large (12 ft. \times 10 ft.) free-air ionisation chamber, and a narrow beam of γ -rays from a source situated <6 ft. from the centre of the chamber. The relevant experimental details are fully discussed. The conditions under which small ionisation chambers can be calibrated by comparison with the large free-air standard are considered. The Sievert unit dose of γ -rays is found to be equiv. under specified conditions to approx. 8r. A revised definition of r so that it can be used as a measure of both γ and X-rays is suggested. G. D. P.

Photo-electric effect of ^2H . L. MORZ and W. RARITA (Physical Rev., 1937, [ii], **52**, 271—273; cf. this vol., 391).—The total photo-electric cross-section of ^2H for an exponential potential is calc. with the best available nuclear consts. The val. obtained for Th-C' γ -rays is 13.1×10^{-28} sq. cm.

N. M. B.
Nuclear photo-effect at high energies. F. KALCKAR, J. R. OPPENHEIMER, and R. SERBER (Physical Rev., 1937, [ii], **52**, 273—278).—Mathematical. Relations are investigated between the cross-sections for reactions and the decay consts. of the compound nuclei for nuclear transmutations when the energy is so high that the levels formed have a smaller spacing than their breadth. Results are applied to the photo-electric disintegration of nuclei of intermediate at. wt. by 17 m.e.v. γ -rays. The connexion between the evaluation of transmutation probabilities and the resonance formulæ appropriate to lower excitation energies is examined. N. M. B.

Magnetic field acting on neutrons inside magnetised iron. O. R. FRISCH, H. VON HALBAN, jun., and J. KOCH (Nature, 1937, **140**, 360).—The precession of neutrons inside magnetised Fe has been investigated. L. S. T.

Expulsion of neutrons from lead by cosmic rays. B. ARAKATSU, K. KIMURA, and Y. UEMURA (Nature, 1937, **140**, 277—278).—An increase in the no. of kicks in a neutron counter when placed inside a Pb chamber suggests that neutrons are liberated from Pb by cosmic ray photons. A further increase occurs when the Pb chamber is filled with paraffin. L. S. T.

Scattering of neutrons by ortho- and para-hydrogen. J. SCHWINGER and E. TELLER (Physical Rev., 1937, [ii], **52**, 286—295).—Mathematical. Cal-

culations indicate that experiments on the scattering of neutrons by *o*- and *p*-H₂ would permit the determination of the sign of the singlet state binding energy and the range of the neutron-proton interaction, and would provide direct information on the spin dependence of the latter. N. M. B.

Neutron scattering cross-section as a function of energy. A. C. G. MITCHELL and R. N. VARNEY (Physical Rev., 1937, [ii], 52, 282—285; cf. A., 1936, 1044).—The study of scattering of neutrons of energy range 0.02—80 v. from Fe, Ni, and Pb was completed by measuring the activation of Ag, Rh, and CH₃I detectors. Indirect determination of the scattering of C neutrons by two methods showed close agreement. The scattering cross-section for Ni decreased slowly with neutron velocity, that for Pb increased slightly, and that for Fe remained const. over the whole range. The directional distribution of neutrons from the top of a paraffin cylinder containing a Ra-Be source agreed closely with calculations based on a cosine distribution law. N. M. B.

Magnetic scattering of neutrons. M. D. WHITAKER (Physical Rev., 1937, [ii], 52, 384).—Attempts to detect the magnetic scattering of slow neutrons by comparing the scattering by certain metals and their respective ions (cf. Halpern, this vol., 489), using Mn, MnO, MnO₂, Fe, and Fe₂O₃, gave negative results. A slight variation between MnS and Mn + S was probably due to the presence of moisture. N. M. B.

Energies of selectively absorbed neutron groups. F. RASETTI, G. A. FINK, H. H. GOLDSMITH, and D. P. MITCHELL (Physical Rev., 1936, [ii], 49, 869).—Measured absorption coeffs. in B, the corresponding relative velocities, and the calc. energies of the C, D, A, and I Fermi-Amaldi neutron groups are recorded. L. S. T.

Experiments with iso-energetic neutrons. E. T. BOOTH and C. HURST (Proc. Roy. Soc., 1937, A, 161, 248—260).—Iso-energetic neutrons, obtained by bombarding D, with D⁺ ions, have a mean free path of 4.6 ± 0.9 cm. in paraffin wax. The elastic scattering cross-section, 1.8×10^{-24} sq. cm., agrees with theoretical prediction. A no. of nuclear reactions has been investigated and the transmutation of S into ³²P + proton is reported. G. D. P.

Retardation of homogeneous neutrons by passage through substances containing hydrogen. G. WETTERER (Ann. Physik, 1937, [v], 30, 284—296).—The energy loss on passage through paraffin wax of neutrons of homogeneous energy obtained by the bombardment of ND₃Cl with deuterons has been investigated and compared with vals. for neutrons from a Ra-Be source. Results using B and Cd indicators agreed with theory of the slowing of neutrons by collision with H nuclei. With a Ag indicator max. of activity of Ag (138 sec.) and Ag (24.6 sec.) were observed at greater neutron speeds. Vals. of the resonance energies for the capture of neutrons by Ag calc. from the position of these max. agree with those obtained by Goldsmith and Rasetti (A., 1936, 1172). The yield of neutrons in the D-D reaction is calc. to be 1.3×10^5 neutrons per sec. per milliamp. for a pure D compound. O. D. S.

Absorption of neutrons slowed down by paraffin at different temperatures. P. N. POWERS, G. A. FINK, and G. B. PEGRAM (Physical Rev., 1936, [ii], 49, 650).—Data showing the changes in absorption by various materials, e.g., Cd, B, Ag, LiF, Sm, Rh, Gd, and HgO, with the paraffin surrounding the Be-Rn source kept at room temp. and then at liquid air temp. are recorded. L. S. T.

Scattering of slow neutrons at atomic lattices. II. G. C. WICK (Physikal. Z., 1937, 38, 689—690; cf. this vol., 389).—Theoretical. The effect of isotopes and nuclear spin on the scattering of slow neutrons at crystal lattices is considered. The effect of isotopes is important when they have considerably different scattering consts. Nuclear spin must be taken into account when there is strong coupling between nuclear and neutron spins, which is the case with H₂. A. J. M.

Method of obtaining polarised neutron beams. H. VON HALBAN, jun. (Nature, 1937, 140, 425).—The possibility of obtaining these beams by selective absorption on passing through a substance cooled to low temp. is pointed out. Paramagnetic salts magnetised at low temp. might be used for this purpose. L. S. T.

Discussion on β -type of nuclear transformations. C. D. ELLIS, J. D. COCKCROFT, R. PIERLS, H. O. W. RICHARDSON (Proc. Roy. Soc., 1937, A, 161, 447—460).—A discussion on the form of the energy distribution in the nuclear β -ray spectrum. G. D. P.

Transmutations of atomic nuclei. N. BOHR (Science, 1937, 86, 161—165).—A summary of lectures. L. S. T.

Time distribution of counts due to a constant source and a radioactive substance which it produces. L. DEVOL and A. RUARK (Physical Rev., 1936, [ii], 49, 877).—A formula for the size-distribution of the time intervals between counts caused by a const. source and a radioactive substance which it produces is given. L. S. T.

Resonances in transmutations of light nuclei. F. KALCKAR, J. R. OPPENHEIMER, and R. SERBER (Physical Rev., 1937, [ii], 52, 279—282).—The sharp resonances observed in many transmutations involving light nuclei require fairly strict selection rules to limit the decay rates of the corresponding compound nuclei, and these follow in several cases from the slowness of the interconversion of spin and orbital angular momentum. Conclusions are discussed in relation to the bombardment of B and F by protons. N. M. B.

Artificial radioactivity with low potentials. E. BERTL, F. OBORIL, and K. SITTE (Z. Physik, 1937, 106, 463—473).—Sufficient neutrons are obtained by bombardment of Be foil with deuteron canal radiation to produce artificial radioactivity in Ag and Rh. Results are discussed theoretically. L. G. G.

Production of artificial radioactivity by means of neutrons. E. AMALDI (Physikal. Z., 1937, 38, 692—734).—A comprehensive review dealing with the production of rapid neutrons, the retardation of neutrons by elastic collisions with protons, neutrons

with energy <1 v., and the production of radioactive nuclei by neutron bombardment. A. J. M.

Artificial radioactivity of very long life. E. McMILLAN (Physical Rev., 1936, [ii], 49, 875—876).—A Be-Al alloy target used as a neutron source and exposed to deuterons for a long period shows an activity, probably due to ^{10}Be , with a min. val. of half-life ≈ 10 years. Mo and brass taken from the same apparatus struck by the deuteron beam show an activity of half-life approx. 3 months, possibly due to $^{13}\text{C} + ^2\text{H} \rightarrow ^{14}\text{C} + ^1\text{H}$. The electrons from both active substances are slow; the absorption curves differ in shape, but have the same end-point.

L. S. T.

Artificial radioactivity of radiophosphorus. Y. Y. SHAN (Z. Physik, 1937, 107, 111—131).—A pressure ionisation chamber for the detection of positrons produced from Al by means of α -particles is described. 14.6 times the no. of ions result from the positrons at pressures of 40 kg. per sq. cm. as at normal chamber pressures. The yield of positrons increases with the range of the α -particles, two maxima at $R = 42.8$ and 53.8 mm. corresponding with resonance levels. Mass absorption coeffs. measured for Al, Fe, Ni, Cu, Zn, Ag, Sn, Pt, and Pb range from 2.6 to 4.0 and \propto the periodic no. of the element. The half-life of radio-P is 3.15 ± 0.05 minutes. L. G. G.

Positron-electron-emitting isomeride in radio-silver. M. L. POOL, J. M. CORK, and R. L. THORNTON (Physical Rev., 1937, [ii], 52, 380).—The periods of Ag radioactive products obtained by bombarding Ag with neutrons from various sources can be explained by assigning to ^{108}Ag the double duty of emitting positrons of period 25.5 min. and electrons of period 8 days. The reactions considered are: $n' + ^{107}\text{Ag} \rightarrow ^{108}\text{Ag} + 2n'$; $n' + ^{108}\text{Cd} \rightarrow ^{108}\text{Ag} + p'$; $^2\text{D} + ^{105}\text{Pd} \rightarrow ^{106}\text{Ag} + n'$; $^4\text{He} + ^{103}\text{Rh} \rightarrow ^{106}\text{Ag} + n'$; $^{106}\text{Ag} \rightarrow ^{106}\text{Pd} + ^0_+1\text{e}$; $^{109}\text{Ag} \rightarrow ^{109}\text{Ag} + ^0_-1\text{e}$.

N. M. B.

Some chemical properties of element 43. C. PERRIER and E. SGRÈ (J. Chem. Physics, 1937, 5, 712—716).—A plate of Mo bombarded with deuterons in a cyclotron shows a strong activity which, after exclusion of all other possible elements by analysis, indicates the presence of a radioactive isotope of Ma. The similarities and differences in the chemical behaviour of Ma and Re are reviewed. Ma closely resembles Re except that Ma does not volatilise in a current of HCl.

W. R. A.

Neutron-induced radioactivity of the noble metals. E. McMILLAN, M. KAMEN, and S. RUBEN (Physical Rev., 1937, [ii], 52, 375—377).—Preliminary results for Hg, Au, Pt, and Ir are reported. Assignments and data for identified activities are tabulated and discussed.

N. M. B.

Analysis of cosmic rays. W. HEITLER (Proc. Roy. Soc., 1937, A, 161, 261—283).—An attempt is made to analyse cosmic rays assuming (a) that the highly penetrating particles are not electrons or (b) that they are electrons. It is concluded that existing observational data are more easily explained under assumption (a), but a final decision must await further experimental evidence.

G. D. P.

Absorption curve of the hard components of cosmic ultra-radiation. A. EHMERT (Z. Physik, 1937, 106, 751—773).—Using the coincidence method with Geiger counters, measurements of cosmic radiation in the sea were made to depths of 243 m. It is shown that the absorption curve may be represented as a power function of the form $N = N_1/h^c$.

H. C. G.

Energy and penetrating power of the cosmic radiation. J. CLAY (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 564—574).—The data concerning the corpuscular nature of cosmic rays are summarised. It is supposed that absorption by matter consists of a decrease in the no. of protons partly by ionisation and radiation, and partly by replacement by neutrons which are later replaced by protons at a lower level.

J. G. A. G.

Heavy particles produced by cosmic-ray counters. C. D. ANDERSON and S. H. NEDDERMEYER (Physical Rev., 1936, [ii], 49, 415).—Approx. 100 of the 7000 cosmic-ray tracks observed at Pike's Peak are due to heavy particles (cf. this vol., 491). Most of the tracks appear due to protons, and are ejected in all directions with little relation to the direction of the incoming beam. In several cases, protons and electrons originate in the same centre, the energies of the latter often being >100 m.e.v. The proton tracks result from the disintegrations produced by both ionising and non-ionising rays, and practically all the heavy tracks can be interpreted only as secondaries produced within the atm. or the material above the chamber. Certain types of disintegrations, hitherto unobserved at sea level, indicate the presence of neutrons at high altitudes. L. S. T.

Cloud chamber study of the ionisation produced by cosmic rays in the neighbourhood of a block of lead. E. G. SCHNEIDER (Physical Rev., 1936, [ii], 49, 871).—For n electrons with sufficient energy to pass through the Pb, approx. $0.5n$ are stopped, and $0.5n$ are created in the Pb by photons (γ), and $0.1n$ electron pairs and $0.01n$ more complicated showers are produced.

L. S. T.

Investigation of cosmic-ray showers at 4000 m. above sea-level. H. C. SHAN, B. B. KISILBASCI, and D. KETILADGE (Proc. Roy. Soc., 1937, A, 161, 95—107).—The Z^2 law for the relative frequency of showers from different elements is as valid at high altitudes as at sea level. The size of showers increases with at no., Z , and with thickness of shower-producing material, indicating that all rays in an average shower are not produced in a single act. The absorption of shower rays follows a Z law and is ascribed to extranuclear electrons. Showers from Pb contain rays with ranges from a few mm. up to several cm. of Pb, those from lighter elements containing on an average rays of longer range. Since the absorption of single shower rays is different from that of the shower as a whole, it is concluded that identification of thickness of shower-producing material (at max. of transition curve) with range is untenable. G. D. P.

Automatic coincidence counter measurements on shipboard of the cosmic-ray latitude effect. T. H. JOHNSON and D. N. READ (Physical Rev., 1936,

[ii], 49, 639).—Preliminary measurements are recorded. L. S. T.

Variation of cosmic-ray showers with altitude from counter measurements. R. H. WOODWARD (Physical Rev., 1936, [ii], 49, 638). L. S. T.

New high-altitude measurements on cosmic-ray intensities. R. A. MILLIKAN, H. V. NEHER, and S. KORFF (Physical Rev., 1936, [ii], 49, 871).—Intensities at altitudes up to >26,000 ft. in S. America and in Asia agree closely. The apparent absorption coeffs. are only slightly different from that in temperate latitudes. L. S. T.

Frequency of occurrence of cosmic-ray bursts as a function of altitude and size of burst. R. T. YOUNG, jun. (Physical Rev., 1936, [ii], 49, 638).—The ratio of frequency of occurrence of bursts at Cambridge, Mass. (1 atm.), and Mt. Evans, Colorado (45 cm.), increases with an increase in size of burst. L. S. T.

World-wide effect in cosmic-ray intensity, as observed during a recent magnetic storm. V. F. HESS and A. DEMMELMAIR (Nature, 1937, 140, 316—317).—Cosmic-ray ionisation was influenced all over the earth by the magnetic disturbances between 24th and 25th April, 1937. A decrease of cosmic-ray intensity followed that of the magnetic intensity. L. S. T.

Cosmic rays and magnetic storms. S. CHAPMAN (Nature, 1937, 140, 423—424; cf. preceding abstract). L. S. T.

Evidence for neutron-proton shells from nuclear masses. H. A. BETHE (Physical Rev., 1936, [ii], 49, 869—870).—Theoretical. L. S. T.

Energy levels of the nuclei of light elements. H. A. WILSON (Physical Rev., 1936, [ii], 49, 415—416).—Hypothetical. L. S. T.

Theory of nuclear forces. A. MARCH (Z. Physik, 1937, 106, 532—538).—Theoretical. The universal length γ occurring in connexion with the theory of nuclear forces and proton-neutron forces is shown to be nearly equal to the classical electron radius. The measurements of Anderson and Neddermeyer and of Blackett and Wilson on the slowing down of high-speed electrons lead to the same val. H. C. G.

Statistics and nuclear reactions. V. WEISSKOPF (Physical Rev., 1937, [ii], 52, 295—303).—Mathematical. Statistical methods are applied to the calculation of nuclear processes when the energies involved are large in comparison with the lowest excitation energies of nuclei. N. M. B.

Kinetic nuclear energy in the Hartree-Fock model. S. TOMONAGA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 229—232).—Mathematical. A. J. M.

Empirical accuracy of mass-energy ratios. W. BRAUNBEK (Z. Physik, 1937, 107, 1—11).—The mean val. of the unit of at. mass ($O = 16$) is 0.922×10^9 e.v. $\pm 1.0\%$. This is calc. from the known energy changes in 31 suitable reactions of at. nuclei and from the latest mass vals. of Aston and Bain-

bridge. Hence the velocity of light $= 2.98_5 \times 10^{10}$ cm. per sec., $\pm 0.5\%$. Limits of error are discussed. H. C. G.

Sign of the magnetic moment of the proton. I. I. RABE, J. M. B. KELLOGG, and J. R. ZACHARIAS (Physical Rev., 1936, [ii], 49, 421—422).—This moment, measured by a method of non-adiabatic transitions, is positive, i.e., it has the spin direction. L. S. T.

Quantitative relationship between the magnetic moments of the atomic nucleus. H. SCHÜLER (Z. Physik, 1937, 107, 12—14).—For heavy at. nuclei with an odd no. of protons, the greater and smaller magnetic moments corresponding with each mechanical moment may be calc. Results agree well with experiment. H. C. G.

Atomic structure. Y. MIMURA and T. IWATSUKI (J. Sci. Hiroshima Univ., 1937, A, 7, 259—261).—Theoretical. A method of treating at. structure on the analogy of Einstein's field theory of gravitation is suggested. O. D. S.

Hydrogen atom in terms of wave geometry. K. MORINAGA (J. Sci. Hiroshima Univ., 1937, A, 7, 263—304).—Mathematical. Both Schrödinger's and Dirac's level systems for the H atom are obtained by the application of the method of Mimura and Iwatsuki (cf. preceding abstract). O. D. S.

Fine structure formula of Sommerfeld and the electron spin. S. C. KAR (Z. Physik, 1937, 106, 418—422).—Theoretical. L. G. G.

Properties of certain vibratory doublets. E. T. JONES (Phil. Mag., 1937, [vii], 24, 458—466).—Theoretical. The common frequency of two electrons at various distances apart is considered. It is improbable that two electrons of opposite sign can, by direct approach, form a doublet. The energy of a moving doublet is considered, and comparison is made between its properties when moving with the velocity of light, and those of the photon. C. R. H.

e/m ratio as determined from the interval between corresponding components of H_α - and D_α -lines. R. C. GIBBS and R. C. WILLIAMS (Physical Rev., 1936, [ii], 49, 416).—An average val. of $\Delta\nu_{H-D} = 4.1470 \pm 0.0004$ cm.⁻¹ was obtained for the interval between the $2p^2P_{3/2} - 3d^2D_{5/2}$ components. This gives $(1.7577 \pm 0.0004) \times 10^7$ e.m.u. per g. for *e/m* and $(5.4908 \pm 0.0005) \times 10^{-4}$ ($^{16}O = 16$) for the at. wt. of the electron. L. S. T.

Image force in quantum mechanics. J. BARDEEN (Physical Rev., 1936, [ii], 49, 640). L. S. T.

Visible radiation produced by electrons moving in a medium with velocities exceeding that of light. P. A. TSCHERENKOV (Physical Rev., 1937, [ii], 52, 378—379; cf. this vol., 220).—The asymmetry of luminescence of the new radiation phenomenon was photographed for 10 different liquids and the inferences discussed are in agreement with theory. N. M. B.

New NH lines in the spectrum of the sun. M. NICOLET (Bull. Acad. roy. Belg., 1937, [v], 23, 646—652).—A list of new NH lines belonging to the (0, 0)

and (1, 1) bands of the resonance system ${}^3\Pi - {}^3\Sigma$ is given. F. J. L.

The system of bands ${}^2\Sigma - {}^2\Sigma$ of the molecule AlO and astrophysical applications. F. DEHALU (Bull. Acad. roy. Belg., 1937, [v], 23, 604—625).—The analysis of the structure of rotation of the series of bands ${}^2\Sigma - {}^2\Sigma$ of AlO shows predissociation in the band 0, 0 and perturbations in the bands 0, 0 and 0, 1. The upper limit of the heat of dissociation of AlO is 3.75 e.v., in good agreement with previous astrophysical observations. F. J. L.

Molecular dissociation in a stellar atmosphere P. LEDOUX (Bull. Acad. roy. Belg., 1937, [v], 23, 582—603).—Mathematical consideration of the dissociation of diat. mols. F. J. L.

Ultra-violet spectra of BeH and BeH⁺. W. W. WATSON and R. F. HUMPHREYS (Physical Rev., 1937, [ii], 52, 318—321).—A BeH band system analogous to the $B^2\Pi \rightarrow X^2\Sigma$ MgH system is reported. Observed bands are the (0, 0) at 1960, (1, 0) at 1882, and (1, 1) at 1956 Å., each consisting of a single Q branch. Data for the first of these and for the ${}^1\Sigma \rightarrow {}^1\Sigma$ BeH⁺ system are tabulated. The complex 3100—3600 Å. BeH spectrum consists only of an extension of the above BeH⁺ system. Analyses of the principal bands of the latter in this region yield revised vals. for the band consts. N. M. B.

Rotation isotope effect in band spectrum of cadmium hydride-deuteride. O. DEILE (Z. Physik, 1937, 106, 405—417).—Photographed 0—0 bands of the $2\Pi - {}^3\Sigma$ transition of CdD are compared with those of CdH and the influence of nuclear mass on rotation- and fine-structure is examined. It is shown in agreement with Van Vleck's formula that the spin separation for the ${}^2\Sigma$ term decreases with increased mass, the contrary holding for the 2Π term. L. G. G.

Band spectrum of thallium hydride. B. GRUNDSTROM (Nature, 1937, 140, 365—366).—Details of bands at 5680 Å. ($\Sigma - \Sigma$ transition?) and 6150 Å., obtained by heating Tl at 1500° in H₂ at 500 mm. pressure, are recorded. L. S. T.

Rotation analysis of the 0 4, 0 → 5, 1 → 4, and 1 → 5 bands of the III. pos. system of CO. B. S. BEER (Z. Physik, 1937, 107, 73—85; cf. A., 1936, 661).—The rotation analysis of the above bands is given and the nature of the perturbation in the various states discussed. H. C. G.

Structure of a new system of CO bands. R. SCHMID and L. GERO (Nature, 1937, 140, 508).—The new system previously reported (this vol., 164) is provisionally designated as $f^3\Sigma \rightarrow a^3\Pi$. L. S. T.

Vibration temperature in relation to rotation temperature in band spectra. N. R. TAWDE and S. A. TRIVEDI (Nature, 1937, 140, 463—464).—Gross intensities of the bands of the AlO blue-green and CN violet systems photographed simultaneously in the same arc have been measured by photographic spectral photometry. For the systems CN, $B^2\Sigma \rightarrow x^2\Sigma$ and AlO, ${}^2\Sigma \rightarrow {}^2\Sigma$ the calc. vibration temp. are 6200° and 3450° K., respectively; corresponding rotation temp. are 6500° and 3275° K. L. S. T.

Interpretation of the absorption spectra of crystals and solutions of rare-earth salts. C. B. ELLIS (Physical Rev., 1936, [ii], 49, 875; cf. A., 1936, 1448).—The first definite identification of the electronic transition causing the colour of a solid is claimed to have been made. Analysis of the data of Prandtl and of Spedding shows that the absorption lines of crystals and solutions of trivalent rare-earth salts are due to "forbidden" transitions between the ground state of the metal ion and the higher levels of the normal configuration, $4f^n$. The lowest excited terms, causing the longest wave bands, of Pr, Nd, Sm, Eu, Gd, Tb, Dy, and Ho are given. L. S. T.

Structure of fluorescence bands in aqueous solutions of terbium salts. A. ZAIDEL, N. KREMENEVSKI, and J. LARIONOV (Bull. Acad. Sci. U.R.S.S., 1937, Ser. Phys., 207—211).—The principal max. in the spectra of Tb₂(SO₄)₃, Tb₂(SeO₄)₃, TbCl₃, and TbBr₃ are at identical λ . TbCl₃ shows additional fluorescence max. in the yellow (TbBr₃ also) and green regions. J. S. A.

Absorption and luminescence spectra of uranyl salts and their solutions. V. L. LEVSHIN (Bull. Acad. Sci. U.R.S.S., 1937, Ser. Phys., 185—206).—The absorption spectra of cryst. UO₂SO₄·3H₂O, K₂UO₂(SO₄)₂·2H₂O, UO₂(NO₃)₂·6H₂O, UO₂(OAc)₂·2H₂O, and K₄UO₂(CO₃)₃ are similar in form, but the absorption max. are shifted to slightly different frequencies according to the anion present. The other cation in double salts has little influence on the spectra. The fluorescence and absorption spectra of the salts are complementary. Dissolution does not affect the position of the bands, but blurs the fine structure, as also does raising the temp. J. S. A.

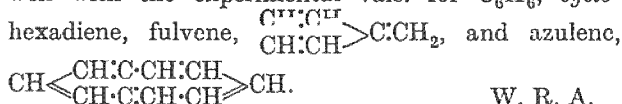
Absorption spectra of complex metallic salts of 2:2'-dipyridyl. K. YAMASAKI (Bull. Chem. Soc. Japan, 1937, 12, 390—394).—Spectra are recorded for [M(dipyridyl)₂]Cl₂ where M is Cu, Zn, Ni, Fe²⁺, and Co²⁺, and for [Co³⁺(dipyridyl)₂]Cl₃ in aq. solution and in EtOH at 15°. At -60° to -70° in EtOH additional narrow bands were found. F. R. G.

Ultra-violet absorption spectra of deuterio-substituted methylamines. T. FORSTER and J. C. JUNGERS (Z. physikal. Chem., 1937, B, 36, 387—397).—A detailed account of work the principal results of which have already been published (this vol., 217). The appearance in high harmonics of the two fundamental frequencies which appear in the formula for the band frequencies indicates that both are to be ascribed to the excited state of the mol. Experiments on the introduction of D in NH₂Me have shown that only two H can be replaced, which excludes the structure CH₂NH₃ (cf. A., 1935, 1052). R. C.

Brillouin effect of benzene as obtained with the concave grating. D. H. RANK (Physical Rev., 1936, [ii], 49, 880).—Photographs of the 4358 and 3650 Å. lines of Hg scattered by C₆H₆ using a 21-ft. concave grating show the Brillouin components. L. S. T.

Theory of colour of organic compounds. A. L. SKLAR (J. Chem. Physics, 1937, 5, 669—681).—Visible and ultra-violet light is absorbed only when the

compound contains chromophoric groups. The alternation of single and double linkings in a chromophore enables several structural formulæ to be written for the mol. No single structural formula represents the mol. completely, but resonance between the various possible structures exists. Absorption bands will arise from resonance between the states corresponding with the different structures. Approx. calculations of the energy levels have been made using the Hund-Mulliken-Hückel and the Heitler-London-Slater-Pauling methods whereby only one parameter enters the calculations and is evaluated from the heats of hydrogenation, and no optical data are necessary. The absorption bands calc. by these methods agree well with the experimental vals. for C_6H_6 , *cyclohexadiene*, fulvene, $C^{III}:C^{IV}$, $CH:CH > C:CH_2$, and azulene,



W. R. A.

Absorption spectra of pyrrole colouring matters. (Pyrromethenes and bilirubinoids.) F. PRUCKNER and A. STERN (Z. physikal. Chem., 1937, 180, 25—43).—Between 240 and 700 $m\mu$, pyrromethenes (I) have a characteristic spectrum of two bands, which are shifted towards the red by substituent alkyl groups and towards the blue by OH. $\cdot COEt$ groups also cause a shift towards the red to an extent which varies with the position of the substituent and therefore serves to distinguish between isomerides. The spectra of salts of (I) with acids and complex salts with metals have two bands which are sharper and more intense than those of (I) but vary little with the acid. The principal bands of (I) and the ultra-violet bands of the corresponding porphyrins seem to be closely related. The absorption curve of urobilin (II) is similar to those of (I), but shifted towards the red. The curve of mesobilirubin (III) is shifted towards the blue compared with that of (II), due to the two OH, which are in the pyrrolenine nuclei. Salt formation by (II) and (III) has the same effect on the absorption as salt formation by (I), showing the presence in (II) and (III) of the (I) structure. It appears that the OH in the hydroxypyrromethenes are in the pyrrolenine nucleus of the (I) system (cf. A., 1937, II, 168). The absorption curve of glaucobilin Me_3 ester differs completely from those of substances with the (I) structure.

R. C.

Quasi-crystalline structure of water from infra-red data. C. H. CARTWRIGHT (Physical Rev., 1936, [ii], 49, 421).—The transmission and reflexion measurements of liquid H_2O in the infra-red from 15 to 150 μ . show characteristics that appear to be due to a hindered rotation and hindered translation of the mols. as a whole in a quasi-cryst. structure. Intermol. binding energies of the H_2O mols. have been calc.

L. S. T.

Infra-red absorption spectrum of liquid water. D. WILLIAMS (Physical Rev., 1936, [ii], 49, 869).—New bands have been found at 6.8 μ . and near 8.6 μ . In the 3 μ . region, absorption is too intense for the satisfactory resolution of all of the separate max.

L. S. T.

Influence of certain ions on the structural temperature of liquid water. J. R. COLLINS and

C. MORAN (Physical Rev., 1936, [ii], 49, 875).—The changes in position and intensity of certain near infra-red absorption bands of liquid H_2O effected by the dissolution of metallic chlorides have been used to indicate the structural temp. of the H_2O in such solutions. Small ions (Li^+ , Mg^{++}) decrease, whilst large ions (Cs^+ , Ba^{++}) increase, this temp. L. S. T.

Optical properties of lithium fluoride crystals in the near infra-red. R. B. BARNES and L. G. BONNER (Physical Rev., 1936, [ii], 49, 648).—Transmissions determined in the region 1—15 μ . are compared with reflexion measurements from 10 to 33 μ . The existence of many secondary max. indicates a complex absorption structure in accordance with theory.

L. S. T.

Properties of crystal powders in the far infra-red. L. G. BONNER and R. B. BARNES (Physical Rev., 1936, [ii], 49, 648).—Christiansen transmission peaks, corresponding with the λ at which n of the crystal equals that of air, have been located in several of a no. of powdered cubic crystals examined in the region 34—126 μ .

L. S. T.

Molecular structure of BF_3 . C. R. BAILEY, J. B. HALE and J. W. THOMPSON (Proc. Roy. Soc., 1937, A, 161, 107—114).—The infra-red spectrum of BF_3 from 1 to 20 μ . has been recorded and fundamental frequencies, combination and overtones assigned. Comparison with Raman spectra shows the mol. to be planar. Force consts. have been calc. on this assumption, and the radius of the B atom is estimated.

G. D. P.

Infra-red absorption spectra of aqueous solutions of acetic acid and its chlorine derivatives. E. K. PLYLER and E. S. BARR (Physical Rev., 1936, [ii], 49, 868—869).—Intense absorption occurs from 4.5 to 6.0 μ . with aq. $AcOH$, $CH_2Cl\cdot CO_2H$, and $CCl_3\cdot CO_2H$ (I). In $AcOH$, max. absorption is at 5.75 μ , and in (I), at 5.4 μ , the change being attributed to the larger dissociation in (I). For concns. from 0.25 to 8N, the coeff. of absorption, and hence the no. of absorbers, is not \propto concn.

L. S. T.

Infra-red dispersion of chloroform and bromoform. M. A. PRTTMAN (Physical Rev., 1936, [ii], 49, 868).—Dispersion of $CHCl_3$ and $CHBr_3$ from visible light to approx. 12 μ . with particular attention to the C-H vibrations has been investigated.

L. S. T.

Spectrum of acetylene in the photographic infra-red. G. W. FUNKE and E. LINDHOLM (Z. Physik, 1937, 106, 518—531).—With an apparatus of increased light-gathering power, nine new bands in the rotation-vibration spectrum of C_2H_2 were examined. Several known bands were examined with increased dispersion and afforded further examples of levels with measurable Q-splitting. Accurate ν_0 vals. for the symmetrical deformation vibration were calc. from measurements on the bands at 7556 \AA . and 9600 \AA . The intensity formula derived by Dennison and others does not hold quantitatively for C_2H_2 . Approx. vals. for the work done in removing H atoms from the mol. were calc.; these indicate that the C-H linking is strengthened by the introduction of CH radicals into mols. such as C_2H_2 and HCN.

H. C. G.

Vibration spectra and molecular structure. III. Infra-red absorption spectra of *cyclopropane* and *ethylene oxide*. L. G. BONNER (J. Chem. Physics, 1937, 5, 704—706).—Infra-red spectra from 1 to 15.5 μ . for gaseous *cyclopropane* and $(\text{CH}_2)_2\text{O}$ and the Raman spectrum of liquid $(\text{CH}_2)_2\text{O}$ are recorded. W. R. A.

Infra-red absorption of nineteen hydrocarbons including ten of high mol. wt. F. W. ROSE, jun. (J. Res. Nat. Bur. Stand., 1937, 19, 143—161; cf. Liddel and Kasper, A., 1934, 238).—Absorption spectra have been measured from 5400 cm^{-1} to 8900 cm^{-1} of CCl_4 solutions of β -, γ -, δ -, and ϵ -methyl-nonane, PhPr^n , PhPr^d , $\gamma\epsilon\epsilon$ -trimethylheptane, $\gamma\delta\epsilon$ -tetramethylhexane, ethyl*cyclohexane*, *n*-nonacosane ($\text{C}_{20}\text{H}_{40}$), and of the following hydrocarbons of high mol. wt. prepared by Mikeska (B., 1936, 1077): α -phenyl- and α -*cyclohexyl*-*n*-octadecane, ϵ -*cyclohexyl*-*n*-docosane, α -(7-tetrahydronaphthyl)-*n*-octadecane, ϵ -(7-tetrahydronaphthyl)-*n*-docosane and *n*- Δ^4 -docosene, ϵ -(2-decahydronaphthyl)-*n*-docosane, diphenyl-*n*-octadecane, ϵ -(*p*-diphenyl)-*n*- Δ^4 -docosene. The data are correlated with structural units of the hydrocarbons. O. D. S.

Infra-red absorption spectrum of deuterium-containing stearic acid. W. W. COBLENTZ and R. STAIR (Physical Rev., 1936, [ii], 49, 869).—A strong band at approx. 4.65 μ ., not present in stearic acid, has been observed. Other strong bands, present in both acids, occur at 2.4, 3.43, 3.8, 5.9, 6.86, 7.1, 7.7, 8.2, and 8.4 μ . L. S. T.

Raman spectra of deuterioethylenes. M. DE HEMPTINNE, J. JUNGERS, and J. DELFOSSE (Nature, 1937, 140, 323).—Lines observed and tabulated for C_2D_4 , $\text{C}_2\text{H}_3\text{D}$, C_2HD_3 , *cis*- and *trans*- $\text{C}_2\text{H}_2\text{D}_2$, and *as*- $\text{C}_2\text{H}_2\text{D}_2$ show a slight discrepancy with the calc. vals. of Manneback and Verleisen. L. S. T.

Chain vibrations of isomeric paraffins and their identification in the Raman spectrum. R. MECKE (Z. physikal. Chem., 1937, B, 36, 347—361).—The chain vibration frequencies of the first six paraffins have been calc. by the model method (this vol., 66), neglecting their interaction with deformation and CH-valency vibrations. From the results all the chain vibration frequencies in the Raman spectra have been identified. The type of chain-branching present may be determined from the val. of the smallest characteristic frequency, viz., >810 for normal chains, 790—820 for Bu^d derivatives, and 720—740 for Me_4 derivatives. The entire Raman spectrum of a saturated hydrocarbon consists of four distinct regions: CH-valency vibrations (2800 to 3000), CH-deformation vibrations (1020 to 1460, +750), C-C valency vibrations (720 to 1000), and C-C flexural vibrations (<600). R. C.

Raman spectra of acid bromides. V. N. THATTE and B. V. THOSAR (Z. Physik, 1937, 106, 423—430).—Raman spectra of one aromatic and a no. of aliphatic bromoacyl bromides excited by 4358 Å. radiation are compared with results for corresponding Cl-derivatives. Shifts for characteristic C-halogen linkages are about 100 wave nos. less in the Br- than in the Cl-compounds. L. G. G.

Raman spectra of some chloroformates. M. S. JOGLEKAR (Phil. Mag., 1937, [vii], 24, 405—409).—Data for the Raman spectra of Me, Et, Pr, and CCl_3 chloroformate are given. The O:C:Cl group gives rise to two shifts 1783 and 476 cm^{-1} characteristic respectively of the C:O and C-Cl linkings. The frequency of the C:O group in O:C:Cl is the same for these compounds as for acid chlorides, but that for the C-Cl linking is different in these two classes of compounds. C. R. H.

Raman spectra of di-*n*-butyl ether and ethyl adipate. F. F. CLEVELAND and M. J. MURRAY (J. Chem. Physics, 1937, 5, 752).—The spectra are recorded and discussed. W. R. A.

Raman displacements in absorption and fluorescence bands of solutions. G. B. BANERJEA and B. MISHRA (Z. Physik, 1937, 106, 669—674).—Absorption and fluorescence bands of anthracene in EtOH, C_6H_6 , Et_2O , and *o*-xylene have been measured photometrically. On the hypothesis that the absorption band and the fluorescence band correspond respectively with exciting line and displaced band in Raman spectra, shifts have been observed and compared with corresponding infra-red frequencies from the Raman effect, good agreement being obtained. L. G. G.

Chemical applications of the Raman effect. I. Polymerisation. II. Common ion effect. J. H. HIBBEN (J. Chem. Physics, 1937, 5, 706—710, 710—712).—I. Raman spectra of Me methacrylate in the monomeric state and in different stages of polymerisation are discussed and compared with data for Me crotonate and *isocrotonate*. Unlike inorg. polymerides, those studied show some quite sharp lines. Polymerisation is accompanied by the disappearance of lines attributable to the C:C and :CH₂ linkings. The spectra of Et maleate and fumarate are also recorded and discussed.

II. As studied by the methods of Raman spectroscopy the ionisation of homopolar compounds appears to increase more rapidly than is to be expected by the amount of dilution. Addition of a common ion will repress this ionisation \propto the concn. of added common ion. Data for the Raman spectra of solutions of ZnCl_2 at different dilutions and the influence of added NaCl and ZnSO_4 are given and discussed. W. R. A.

Fluorescence of the chlorophyll series: fluorescence and photodecomposition of solutions of chlorophyll-*a* under oxygen, carbon dioxide, and nitrogen. H. V. KNORR and V. M. ALBERS (Physical Rev., 1936, [ii], 49, 420).—In COMe_2 , max. on the densitometer curves occur at 679 and 647 $\text{m}\mu$. under O_2 , 677 and 646 $\text{m}\mu$. under CO_2 , and 679 and 648 $\text{m}\mu$. under N_2 . In C_6H_6 , corresponding max. are at 683 and 651 $\text{m}\mu$. under O_2 , 683 and 650 $\text{m}\mu$. under CO_2 , and 679 and 649 $\text{m}\mu$. under N_2 . The appearance of the fluorescence spectra for the COMe_2 solutions during photodecomp. is quite different from that of the C_6H_6 solutions under the same gases. Stable conditions appear to be established in the C_6H_6 solutions since the intensity of the fluorescence is strong after exposure for many hr. to the radiation. The fluorescence in the COMe_2 solutions under N_2

and CO_2 disappears after exposure for 2 hr. The appearance of additional max., and variation of the relative intensities of the max., indicate that solvent and atm. are determining factors in the photodecomp. of chlorophyll-*a*.
L. S. T.

Zinc sulphide-cadmium sulphide phosphors. K. KAMM (Ann. Physik, 1937, [v], 30, 333—353).—Phosphors activated by Cu and by Ag have been prepared from a complete range, 0—100% CdS, of ZnS-CdS mixtures. The intensity, spectral distribution, and period of luminescence of the phosphorescence are described.
O. D. S.

Cement phosphors. M. TRAVNÍČEK (Ann. Physik, 1937, [v], 30, 224—244; cf. A., 1933, 917).—Phosphors composed of fluorescein, aesculin, $p\text{-C}_6\text{H}_4(\text{CO}_2\text{H})_2$, carbazole, phenanthrene, and C_{10}H_8 added to a MgO cement containing MgCl_2 , MgI_2 , MgBr_2 , etc. are described. These phosphors have long periods of luminescence, 2 hr. for the oxychloride (I)-carbazole phosphor. It is deduced from the ignition loss of the (I) cement that the MgCl_2 is present as $\text{MgCl}\cdot\text{OH}\cdot\text{H}_2\text{O}$. The spectral distribution of the emitted light and its variation with λ of the exciting light are described. A reversible blue coloration is produced in (I)-carbazole phosphor by illumination. The variation of period of luminescence of MgOClBr - and MgOCl(KI) -carbazole phosphors with the ratio of Cl' to Br' or I' has been measured.
O. D. S.

Analysis of the conditions of excitation of electro-photoluminescent phenomena. G. DESTRIAU (J. Chim. phys., 1937, 34, 462—472; cf. this vol., 395).—Equations for the electric fields produced in a crystal of luminescent substance by applying to the crystal const., sinusoidal, and uniformly increasing fields are correlated with the data (*loc. cit.*). The luminescence depends not only on the rate of variation of the field but also on its abs. val. The conductivity increases in very intense fields.
J. G. A. G.

Ionising effect of cathode rays in different gases and gas mixtures. W. GERBES (Ann. Physik, 1937, [v], 30, 169—183).—Results for N_2 , O_2 , CO_2 , C_2H_6 , SO_2 , A, and Ne for cathode rays of 10—40 kv. are recorded and discussed. Measurements are also given for different $\text{C}_2\text{H}_6\text{-N}_2$ mixtures at 20 kv.
W. R. A.

Electrical and optical behaviour of half-conductors. XII. Inner photoelectric effect in crystalline cuprous oxide. G. FALTZ (Ann. Physik, 1937, [v], 30, 193—208).—The spectral yields of Cu_2O plates in electrolytic solutions have been investigated both for compensated and short-circuited currents. For the strongly-absorbed $\lambda\lambda$ 436, 405, and 365 $\mu\mu$, an electron absorbs $h\nu$ but in the regions of weaker absorption at 546 and 578 $\mu\mu$, the yield is greatly diminished because of the stronger electron diffusion.
W. R. A.

Photo-conductivity and phosphorescence of zinc blende. A. L. REIMANN (Nature, 1937, 140, 501—502).—The resistance of Zn blende after excitation by blue light and "quenching" by infra-

red light is a linear function of time. The mechanism of photo-conduction is discussed.
L. S. T.

Electron conductivity and photochemical processes in alkali halide crystals. R. W. POML (Proc. Physical Soc., 1937, 49, Extra Part, 3—31; cf. A., 1936, 139).—A comprehensive survey of the optical properties of pure alkali halide crystals and those containing a stoichiometric excess of one of the components, giving rise to colour centres; the motion of electrons released photo-electrically and thermally in the interior of these crystals, and the connexion between electron conductivity and ionic conductivity; and photo-chemical processes in the crystals and the optical and electrical measurement of photochemical yield.
N. M. B.

Trapped electrons in polar crystals. R. W. GURNEY and N. F. MOTT (Proc. Physical Soc., 1937, 49, Extra Part, 32—35).—Mathematical. An investigation of the properties and expected behaviour of an extra electron in a crystal without crystal imperfections, and the possible identification of these trapped electrons with *F* centres.
N. M. B.

Alkali halide phosphors containing heavy metals. R. HILSCH (Proc. Physical Soc., 1937, 49, Extra Part, 40—45).—A discussion of the absorption and emission spectra of phosphors obtained by adding small concns. of a heavy-metal halide to molten alkali halides and of the mol. complexes formed in the single crystals.
N. M. B.

Effects of temperature on the intensity of fluorescence of some impurity solids. J. T. RANDALL (Proc. Physical Soc., 1937, 49, Extra Part, 46—56).—A survey and discussion of measurements on the effects of temp. on the intensity of fluorescence of various forms of ZnS, CdS-ZnS, and $\text{CdI}_2\text{-Al}_2\text{O}_3$ containing traces of various metallic impurities, and the relation of results to the theory of semi-conductors.
N. M. B.

Semi-conductors with partially and with completely filled 3*d*-lattice bands. J. H. DE BOER and E. J. W. VERWEY (Proc. Physical Soc., 1937, 49, Extra Part, 59—71).—An explanation of the lack of conductivity, if the no. of electrons per atom is an integer, of a class of semi-conductors or insulators with incompletely filled 3*d* bands. The discussion and the removal of the integral restriction are illustrated by reference to NiO, Cu_2O , and ZnO.
N. M. B.

Structure of thin metallic films. G. I. FINCH (Proc. Physical Soc., 1937, 49, Extra Part, 113—117).—An account of the structural features, as revealed by electron diffraction, which cause or contribute to the abnormally low conductance of thin metallic films.
N. M. B.

Factors influencing the resistance of thin metal films. E. T. S. APPELYARD (Proc. Physical Soc., 1937, 49, Extra Part, 118—135; cf. this vol., 291).—An account of the deposition and investigation of coherent films of alkali metals <50 Å. thick on glass, and variations of experimental conditions to give films of any desired resistivity from the low val. shown by the coherent films to vals. 10^5 times as

great. Evidence is given that this high resistance is due to granulation or agglomeration of the film.

N. M. B.

Electrical properties of thin films of platinum obtained by cathode sputtering in air and other gases (He, N₂, O₂, and H₂). A. FÉRY (Proc. Physical Soc., 1937, 49, Extra Part, 136—137).—In view of discordant vals. of resistivity and crit. thickness of Pt films, investigations are reported of deposits made with special precautions and without heating the substrate. The films are of Pt-black, and on heating in vac. undergo a series of alternate reversible and irreversible resistivity changes with a series of crit. thresholds and transition points. At 340° the resistance corresponds with that for white Pt and a new curve is obtained with crit. thickness near 50 mμ., but at thickness 3—6 mμ. the curve joins up with that of Pt-black. The resistance variation of deposits formed in the simple gases is discussed.

N. M. B.

Fluctuations in the resistance of thin films. J. BERNAMONT (Proc. Physical Soc., 1937, 49, Extra Part, 138—139).—A summary of mathematical expressions for available data and theory.

N. M. B.

Migration and aggregation of atoms on solid surfaces. J. E. LENNARD-JONES (Proc. Physical Soc., 1937, 49, Extra Part, 140—150).—Mathematical.

N. M. B.

Measurement of conductivity and p_H . Application to pure water. R. CLIQUET-PLEYEL (Document sci., 1935, 4, 104—113; Chem. Zentr., 1936, i, 3652).—The val. 0.04×10^{-4} for the conductivity of pure H₂O is in agreement with theoretical considerations. The p_H of H₂O saturated with air, and hence containing CO₂, is taken as 5.8.

J. S. A.

Conductivity measurements and p_H measurements. A. KLING and A. LASSIEUR (Document sci., 1935, 4, 225—229; Chem. Zentr., 1936, i, 3652—3653).—The conclusions of Cluquet-Pleyel (preceding abstract) are disputed.

J. S. A.

Discharge of a condenser through a tube of gas. M. LAPORTE (J. Phys. Radium, 1937, [vii], 8, 332—342).—The discharge of a condenser through a tube of gas is analogous to the discharge through a metal resistance.

F. J. L.

Electric moments of dioxans and dioxolans. M. M. OTTO (J. Amer. Chem. Soc., 1937, 59, 1590—1592).—Electric moments have been determined for 2-methyl-, 2:4-dimethyl-, 2:4:4:5:5-pentamethyl-, 2-bromomethyl-, and 2:2-dimethyl-1:3-dioxolan (1.21, 1.32, 1.29, 2.28, and 1.12×10^{-18}) and for 2-methyl-, 2-methyl-2-amy-, and 2-bromo-methyl-1:3-dioxan (1.89, 1.90, and 2.89×10^{-18}). The results are discussed.

E. S. H.

Molecular volumes and expansivities of liquid normal hydrogen and para-hydrogen. R. B. SCOTT and F. G. BRICKWEDDE (J. Chem. Physics, 1937, 5, 736—744).—Measurements of mol. vols. and expansivities of liquid *n*- and *p*-H₂ between 14° and 20.4° K. with a fused quartz dilatometer show that the changes in mol. vol. and lattice energies of H₂ in passing from the mol. rotational state (*o*-H₂) to the

non-rotational state (*p*-H₂) are opposite in direction to those observed for the same changes in other substances. The state of non-rotating *p*-H₂ is fundamentally similar to that of rotation in other substances at high temp. These differences are due to a difference in magnitude and symmetry of the intermol. forces of repulsion arising from the distribution of the average electron density of *o*-H₂ and *p*-H₂.

W. R. A.

Absorption of centimetre waves in liquids and solutions. D. ELLE (Ann. Physik, 1937, [v], 30, 354—370).—Measurements have been made at λ 4 cm. for glass, C₆H₆, cyclohexane, EtOH, glycerol containing varying % of H₂O, aq. solutions of fructose and of HCl, NaCl, and BaCl₂. The absorptions of glass, C₆H₆, and cyclohexane are small and approx. equal. The refractive index, *n*, of glass is 2.67 ± 0.05 and agrees with the val. of Rubens. C₆H₆ has $n^{18} 1.48 \pm 0.02$, which is equal within experimental error to $\epsilon^{\frac{1}{2}}$. The transition λ , λ_c , of EtOH and H₂O are calc. from their absorption coeffs. Vals. disagree with those of von Ardenne *et al.* (A., 1936, 1182). A max. absorption was observed in fructose solutions at 33% fructose. λ_c calc. at this concn. agrees with the val. of Wien for 33.3% sucrose solution (this vol., 65). The variation in absorption of the electrolyte solutions with temp. and concn. (1—5N) was followed, and λ_c of H₂O at 18° is calc. and agrees with the val. of Schmelzer (*ibid.*, 65).

O. D. S.

Magnetic rotation spectra of polyatomic molecules in the ultra-violet. P. KUSCH and F. W. LOOMIS (Physical Rev., 1936, [ii], 49, 879—880).

L. S. T.

Magneto-optical dispersion of organic liquids in the ultra-violet region of the spectrum. XI. Magneto-optical dispersion of methyl malonate, isopropyl propionate, isopropyl butyrate, ethyl isobutyrate, and *tert*.-butyl alcohol. C. J. MARSDEN and E. J. EVANS (Phil. Mag., 1937, [vii], 24, 377—395).—Vals. for *n* and magneto-optical rotation are recorded. The magneto-optical dispersion can be represented by $n\delta = K\lambda^2/(\lambda^2 - \lambda_1^2)^2$, where δ is Verdet's const. for wave-length λ , λ_1 is the wave-length of the absorption band in the Schumann-Lyman region, and *K* is a const. For compounds of similar structure the addition of CH₂ increases the val. of λ_1 by approx. 0.0012 μ. The vals. of λ_1 for Bu^oOH, Bu^oOH, and Bu^oOH are approx. the same. *n*- and *iso*-esters of the same empirical formula also have approx. the same vals. of λ_1 . The data are discussed in relation to Larmor's theory of magnetic rotation.

C. R. H.

Calculation of the energy of H₃ and H₃⁺. III. J. HIRSCHFELDER, H. DIAMOND, and H. EYRING (J. Chem. Physics, 1937, 5, 695—703).—Mathematical. The energy of H₃ and of H₃⁺ previously calc. (A., 1936, 411) by the variational method for symmetrical linear configurations is now obtained for two linear unsymmetrical configurations. The activated state for the reaction H + H₂ is located as the symmetrical linear configuration, whilst, employing semi-empirical methods, the activated state is unsymmetrical.

For the symmetrical configuration H_3^+ has min. energy. Linear vibration frequencies are calc.

W. R. A.

Specific oscillations of tetrahedral molecules.

E. A. HYLLERAAS (Z. Physik, 1937, 107, 86—90).—On the assumption that the central atom A , in a mol. AB_4 , exerts attractive forces on the B atoms and that the B atoms mutually repel, sp. oscillations and the corresponding sp. frequencies are derived mathematically.

L. G. G.

Electron affinity of the hydroxyl group. II.

J. GOUBEAU and W. KLEMM (Z. physikal. Chem., 1937, B, 36, 362—370).—The lattice energies of the alkali hydroxides have been calc. by a method more precise than that used previously (this vol., 115). The results indicate that NaOH, KOH, RbOH, and CsOH have co-ordinated lattices similar to that of NaCl. The energy of hydration of the OH' ion is < that of the F' ion by 2 kg.-cal., and the electron affinity of OH is 48 kg.-cal.

R. C.

Calculation of the rotation constants of diatomic molecular terms from perturbation data.

I. KOVÁCS (Z. Physik, 1937, 106, 431—438).—Theoretical. Rotation and vibration consts. of $I^2\Sigma$ terms may be calc. from perturbation of the $A^{1\Pi}$ terms.

H. C. G.

Stability of degenerate electronic states in polyatomic molecules. H. JAHN and E. TELLER (Physical Rev., 1936, [ii], 49, 874).

L. S. T.

Stability of polyatomic molecules in degenerate electronic states. I. Orbital degeneracy.

H. A. JAHN and E. TELLER (Proc. Roy. Soc., 1937, A, 161, 220—235).—Orbital electronic degeneracy and stability of nuclear configuration are shown to be incompatible unless all the atoms of the mol. lie in a straight line. Results are tabulated showing the no. of proper vibrations of a given symmetry type for any polyat. mol. Only slight instability results if the electrons causing degeneracy are not essential for mol. binding.

G. D. P.

Energy bands of crystals. (A) Effect of time-reversal symmetry. (B) Accidental degeneracy. C. HERRING (Physical Rev., 1937, [ii], 52, 361—365, 365—373).—Mathematical.

N. M. B.

Atomic forces of solid state. VI. Non-metals. W. WEN-Po (Phil. Mag., 1937, [vii], 24, 466—472).—Mathematical. At. vibrational frequency is considered in relation to sp. heat, compressibility, m.p., thermal expansion, and surface tension formulæ.

C. R. H.

Lattice energy of solid carbon dioxide. H. SPONER and M. BRUCH-WILLSTATTER (J. Chem. Physics, 1937, 5, 745—751).—Mathematical. The London theory of van der Waals forces gives a fair representation of the sublimation heat of solid CO_2 .

W. R. A.

Lattice energies and transition temperatures of caesium chloride and ammonium chloride. A. MAX (Physical Rev., 1937, [ii], 52, 339—347).—The lattice energies of CsCl and NH_4Cl are calc. by the Born-Mayer method for both the CsCl and NaCl type lattices, and the temp. of transition between these two forms are determined from the equality

of the free energies with the help of the elastic consts. and proper frequencies. Calc. transition temp. are in only rough qual. agreement with experimental vals.

N. M. B.

Wave functions in halite. W. SHOCKLEY (Physical Rev., 1936, [ii], 49, 874).—The Wigner-Seitz method of cellular potentials has been applied to the calculation of wave functions in NaCl.

L. S. T.

Surface tension of mercury in presence of nitrogen, hydrogen, and carbon dioxide. M. KERNAGHAN (Physical Rev., 1936, [ii], 49, 414; cf. A., 1936, 1053).—Data for pressures up to 300 mm. are recorded.

L. S. T.

Parachor studies at various temperatures. C. A. BUEHLER, T. S. GARDNER, and M. L. CLEMENS (J. Org. Chem., 1937, 2, 167—174).—[P] of the co-ordinate compounds $EtNO_3$, Et_2SO_3 , Et_2SO_4 , $PhSO_2Cl$, $p-C_6H_4Me\cdot SO_3Me$, $p-C_6H_4Me\cdot SO_2Cl$, and SO_2Cl_2 is determined, at several temp. for each. At lower temp., e.g., 40° or 70°, there is a negative deviation from Sugden's calc. [P], but at higher temp. a positive deviation. The anomaly is not due to association: the substances have not the character of associated liquids, and the val. of the Ramsay-Shields-Eötvös const. for each is near to 2.12. From the temp. effect a distinction may be made between the co-ordinate and the covalent linkage. [P] of o -, m -, and p - $NO_2\cdot C_6H_4\cdot OH$, of o -, m -, and p - $OH\cdot C_6H_4\cdot CO_2Me$, of o -, m -, and p - $OH\cdot C_6H_4\cdot CHO$, and of o - and p - $C_6H_4Ac\cdot OH$ is also determined. In the o -compounds, containing a chelate linkage (A., 1930, 1240), [P] has a negative val., from -10.8 to -14.2, with no temp. coeff.; the remainder have [P] increasing with temp.

E. W. W.

Small-angle X-ray scattering. B. E. WARREN (Physical Rev., 1936, [ii], 49, 885).—Results obtained with fine-grained SiO_2 flour are described. The application of the effect to the measurement of particle size is discussed.

L. S. T.

Determination of the size and shape of crystal particles by X-rays. A. L. PATTERSON (Physical Rev., 1936, [ii], 49, 884).—X-Ray interference functions for particles of very general shapes can be obtained by a new method based on Fourier analysis. Bragg's method is used to discuss the problem of the shape of particles from X-ray data.

L. S. T.

Fourier analysis of X-ray scattering from polyatomic liquids. W. C. PIERCE (J. Chem. Physics, 1937, 5, 717—720).—A simplified form of the Fourier integral analysis of the X-ray scattering of polyat. liquids containing like atoms is discussed and applied to Katzoff's data for C_6H_6 (A., 1935, 152). The distribution function thus obtained indicates that a given mol. is surrounded by six oriented neighbours in the plane of the ring and that the mean separation of centres is approx. 6.7 Å. Parallel planes of flat mols. are separated by 3.7 Å. The structure closely resembles the crystal structure of C_6Me_6 .

W. R. A.

Effect of discontinuities of the background on the evaluation of the intensities of X-ray reflexions from crystalline powders. A. BAXTER and J. C. M.

BRENTANO (Phil. Mag., 1937, [vii], 24, 473—492).—A general discussion of means of avoiding errors arising from background discontinuities due, principally, to absorption steps and to sudden sensitivity changes of the photographic emulsion for certain $\lambda\lambda$. The selection of lines free from interference is considered preferable to averaging measurements from a no. of lines. C. R. H.

Debye-Waller temperature factor for anisotropic crystals. E. O. WOLLAN (Physical Rev., 1936, [ii], 49, 422).—The apparently anomalous X-ray reflecting power of Zn (A., 1936, 3) is in accord with the predictions of the Debye-Waller theory as extended by Zener (A., 1936, 273) to anisotropic crystals. L. S. T.

Recrystallisation of bent drawn aluminium wire. T. HUDITA (J. Sci. Hiroshima Univ., 1937, A, 7, 323—326).—The structure at the point of max. curvature of a bent Al wire has been observed, after recrystallisation, by means of convergent X-rays. Recrystallisation is not perfect. O. D. S.

Effect of stress on the X-ray spectral line obtained with a single-crystal wire of tungsten by using the method of convergent X-rays. T. FUJIWARA (J. Sci. Hiroshima Univ., 1937, A, 7, 315—321).—Indications of elastic distortion of the crystal lattice and of small bodily movements were observed on stretching. O. D. S.

Exchange of energy between a platinum surface and helium atoms and its dependence on the structure of the surface. W. B. MANN (Proc. Roy. Soc., 1937, A, 161, 236—247).—An electron diffraction investigation of the thin protective film formed on Pt by heating in O_2 shows that the film has a body-centred tetragonal structure, a 5.38, c 4.43 Å. Its chemical composition is not known (cf. A., 1935, 8). G. D. P.

Theory of Brillouin zones and symmetry properties of wave functions in crystals. L. BOUCKAERT and R. SMOLUCHOWSKI (Physical Rev., 1936, [ii], 49, 875). L. S. T.

Asymmetry in metals of hexagonal structure. G. W. BRINDLEY and P. RIDLEY (Nature, 1937, 140, 461—462).—A discussion of the two kinds of asymmetry, viz., that of the lattice vibrations and that of the atoms, found in certain metals, particularly Zn and Cd, having a hexagonal structure. Evidence for a different type of asymmetry in Ru, due to a concn. of electron density of the kind illustrated, has been obtained. L. S. T.

Amorphous state of metals. J. KRAMER (Z. Physik, 1937, 106, 675—691; cf. A., 1934, 244).—The prep. of amorphous metals is described, and their properties and the mechanism of transition from the amorphous to the cryst. state are discussed. L. G. G.

Structure of thin metallic layers. J. KRAMER (Z. Physik., 1937, 106, 692—701; cf. preceding abstract).—The relation between transition temp. and the geometry of the metallic layer is considered. L. G. G.

Thickness of silver chloride film produced on the surface of a silver plate. S. SHIMADZU (Mem. Coll. Sci. Kyoto, 1936, 19, A, 229—236; cf. A., 1935, 918).—The thickness of AgCl films formed on thin Ag plates immersed in HOCl is determined by comparing the intensity of the (220) AgCl X-ray reflexion with the (200) Ag reflexion. The influence of temp., [HOCl], and size of the Ag grains on the rate of formation of the AgCl film is investigated. F. J. L.

The swarm theory of liquid crystals. R. FURTH and K. SITTE (Ann. Physik, 1937, [v], 30, 388—400).—The swarm theory is preferred to the continuum theory. Four independent methods of calculation, from measurements of the effect of magnetic fields on the dielectric const. of liquid crystals and from the results of Tropper (cf. this vol., 555), give vals. of swarm dimensions between 2.5×10^{-5} and 4×10^{-5} cm. O. D. S.

Possibility of formation of small crystals in melts at temperatures above the melting points. R. KAISCHEV (Ann. Physik, 1937, [v], 30, 184—192).—The possibility of small crystals (sub-nuclei) forming in melts at temp. $>$ m.p. is theoretically considered. W. R. A.

X-ray scattering in molten salts. I. K. LARK-HOROVITZ and E. P. MILLER (Physical Rev., 1936, [ii], 49, 418).—Diffraction patterns from molten LiCl, LiBr, NaCl, and KCl have been obtained with monochromatic Ag $K\alpha$ radiation. The patterns of LiCl and LiBr are sharper than the patterns usually observed in liquids. NaCl yields a diffuse pattern, which is much less sharp than that of KCl. In the KCl crystal any atom has 6 equiv. neighbours in a distance of 3.14 Å. and 12 in one of 4.44 Å. L. S. T.

Stereochemistry of quadricovalent atoms: cobalt and manganese. E. G. COX, A. J. SHORTER, W. WARDLAW, and W. J. R. WAY (J.C.S., 1937, 1556—1559).—Cryoscopic and ebullioscopic determinations show that both α - and β - $CoCl_2 \cdot 2C_5H_5N$ are unimol. X-Ray analysis shows that the α -form possesses a planar *trans*-configuration. This fact, in conjunction with the known tetrahedral structure of $[CoCl_4]^{2-}$, provides the first instance of a bivalent metal having unchelated quadricovalent derivatives of $>$ one configuration. The β -form is isomorphous with the only known forms of $CoBr_2 \cdot 2C_5H_5N$ and $CoI_2 \cdot 2C_5H_5N$, but its structure is uncertain. $MnCl_2 \cdot 2C_5H_5N$ is isomorphous with $CoCl_2 \cdot 2C_5H_5N$ and has a planar structure. A. J. M.

Isomorphism and supersaturation. L. J. KLINKENBERG (Chem. Weekblad, 1937, 34, 617—619).—The development of the idea of isomorphism and its definition, especially in connexion with the X-ray analysis of crystals, is discussed. Experiments with supersaturated solutions of $KClO_4$ and NH_4ClO_4 seeded with $BaCrO_4$, $BaSO_4$, $BaWO_4$, $BaMoO_4$, and $PbSO_4$ show that $BaCrO_4$ is most effective in bringing about crystallisation. S. C.

Dehydration nuclei on crystals of copper sulphate pentahydrate. W. E. GARNER and H. V. PIKE (J.C.S., 1937, 1565—1568; cf. A., 1935,

151).—The shapes of the dehydration nuclei on the 110, 120, 010, 110, 100, 021, 111, 021, and 121 faces of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ have been investigated. The prominent directions of growth are in definite crystal planes, particularly 010. This is discussed in connexion with the arrangement of Cu^{++} , SO_4^{--} , and H_2O in the crystal lattice (A., 1934, 243). The shapes of the dehydration nuclei are dependent on the activation energy for removal of H_2O mols., variable with direction, the collapse of the lattice, hindering the escape of H_2O in certain directions, and the curvature of the interface, affecting the rate of recombination of H_2O .
A. J. M.

Salts of hexahydrated cations. II. Magnesium chlorite hexahydrate. A. FERRARI and C. COLLA (Gazzetta, 1937, 67, 424—428; cf. this vol., 502).— $\text{Mg}(\text{ClO}_2)_2 \cdot 6\text{H}_2\text{O}$ belongs to the tetragonal system, 4 mols. per unit cell, a 10.29, c 10.55 Å., and its structure is analogous to that of $\text{Mg}(\text{H}_2\text{PO}_2)_2 \cdot 6\text{H}_2\text{O}$. The structure of the ClO_2^- anion agrees with the Lewis-Langmuir octet theory.
O. J. W.

X-Ray study of the systems $\text{CaO-Al}_2\text{O}_3$ and $\text{SrO-Al}_2\text{O}_3$. K. LAGERQVIST, S. WALLMARK, and A. WESTGREN (Z. anorg. Chem., 1937, 234, 1—16).—There are five Ca aluminates and four Sr aluminates which are exactly analogous to four of the Ca compounds. $3\text{Ca}(\text{Sr})\text{O} \cdot \text{Al}_2\text{O}_3$ have simple cubic lattices with a 15.22 and 15.79 Å., respectively, instead of the smaller dimensions given by Steele and Davey (A., 1929, 1131). $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$ is body-centred cubic, a 11.95 Å., as found by Bussem and Eitel (this vol., 288), but an alternative interpretation of the structure, corresponding with the formula $9\text{CaO} \cdot 5\text{Al}_2\text{O}_3$, is possible. $\text{Ca}(\text{Sr})\text{O} \cdot \text{Al}_2\text{O}_3$ have a low degree of symmetry, and the lattice dimensions could not be determined. $\text{Ca}(\text{Sr})\text{O} \cdot 2\text{Al}_2\text{O}_3$ are monoclinic, with a 12.82, b 8.84, c 5.42 Å., β 107.8° and a 12.94, b 9.00, c 5.54 Å., β 106.3°, respectively. $3\text{Ca}(\text{Sr})\text{O} \cdot 16\text{Al}_2\text{O}_3$ are isomorphous with $\beta\text{-Al}_2\text{O}_3$, and have a 5.536, c 21.825 Å. and a 5.557, c 21.945 Å., respectively.
F. J. G.

Crystal-forms of complex salts of triaminopropane with tervalent cobalt and rhodium. P. TERPSTRA and J. TER BERG (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 602—606).—Crystallographic data are recorded for the following: triaminopropane hydrochloride + H_2O , $\{\text{Co}(\text{tpn})_2\}\text{Cl}_3$, $\{\text{Co}(\text{tpn})_2\}\text{Br}_3$, $\{\text{Co}(\text{tpn})_2\}\text{I}_3$, space-group probably D_{3d} , $\{\text{Co}(\text{tpn})_2\}(\text{SCN})_3$, $\{\text{Rh}(\text{tpn})_2\}\text{Cl}_3$, $\{\text{Rh}(\text{tpn})_2\}\text{Br}_3$, and $\{\text{Rh}(\text{tpn})_2\}\text{I}_3$ (tpn = triaminopropane).
J. G. A. G.

Structure of organic molecules by X-ray analysis. J. M. ROBERTSON (Sci. Progr., 1937, 32, 246—265).—A review.

Structure of the guanidinium ion compared with borates, carbonates, and nitrates. W. THIELACKER (Fortschr. Min., 1936, 20, 64—66; Chem. Zentr., 1936, i, 3663).—Investigation of guanidinium halides shows that the ion $\text{C}(\text{NH}_2)_3^+$ is planar, the NH_2 being situated at the corners of an equilateral triangle with the C in the centre; in the iodide the diameter of the NH_2 group is 1.49 Å. In compounds of the type $A(\text{BX})_3$, r_A/r_X has the val. 0.41—0.75 if A has co-ordination no. 6, 0.73—1.00 if this is 8, and higher vals. if it is 12. It is concluded

that the co-ordination no. is 8 in guanidinium bromide and 12 in the iodide.
H. N. R.

Fibrous structure of paraffin. H. RIJUSAN (Mem. Coll. Sci. Kyoto, 1936, 19, A, 279—282).—The fibre structure of paraffin drawn into the form of a wire is practically unaffected by heat-treatment at < m.p.
F. J. L.

Structure of *o*-diphenylbenzene ($\text{C}_{18}\text{H}_{14}$). C. J. B. CLEWS and K. LONSDALE (Proc. Roy. Soc., 1937, A, 161, 493—504).—The crystals are orthorhombic, space-group $P2_12_12_1$, having 4 mols., $\text{C}_{18}\text{H}_{14}$, in each unit cell. d^{16} 1.166 g. per c.c.; the parameters of the cell are 18.6, 6.05, and 11.8 Å. Measurement of the intensity of X-ray reflexions gave no clear indication of the mol. structure. Conclusions as to the orientations of the mols. are drawn from the principal diamagnetic susceptibilities. The most likely structure is that in which two Ph groups have their planes turned in the same direction, about 50° out of the plane of the C_6H_4 nucleus.
G. D. P.

Hydrogen bridges in solid pentaerythritol. I. NITTA and T. WATANABÉ (Nature, 1937, 140, 365).—A quant. crystal analysis by the method of Fourier series shows that the space-group is S_4^2-14 (cf. A., 1926, 665). The central C is at 000, and is surrounded tetrahedrally by the four methylenic C at xyz , xyz , yxz , and yzx with x 0.165, y 0.140, and z 0.10, giving 1.57 Å. for interat. distance of the C—C linking. The four hydroxyl O are arranged so that the parameters x , y , and z are 0.313, 0.265, and 0.00, respectively, giving 1.46 Å. for the C—O linking distance. The O lie in the same plane $z = 0$ as the central C. If the H of the OH are disregarded, the mol. possesses approx. the symmetry of $D_{2d}-42m$ with one pair of primary alcohol radicals puckered upwards and the other downwards, all the bond angles of these atoms being approx. tetrahedral. The most interesting feature of the structure is the close approach of the OH on adjoining mols. In the plane $z = 0$, four O, one from each mol., form a square of side 2.55 Å., and this val. for the O—O distance, which must be bridged by an H, is < that assigned by Bernal and Megaw to their "hydroxyl bond" (A., 1935, 1307). The mols. in a layer parallel to (001) are linked more or less firmly to each other by H bridges in closed rings.
L. S. T.

Crystal structure of cellulose. E. SAUTER (Z. physikal. Chem., 1937, B, 36, 427—434).—A reply to criticism (this vol., 562).
R. C.

X-Ray investigations of additive compounds of cholesterol.—See A., II, 416.

Structure of polyvinyl acetate. L. MISCH and L. PICKEN (Z. physikal. Chem., 1937, B, 36, 398—404).—The elastic properties, optical behaviour, and X-ray diagram indicate that polyvinyl acetate is similar in structure to vulcanised rubber and consists of a loose network of mol. chains in the interstices of which free chains are embedded. On stretching above 50° the chains assume a parallel orientation, but crystallisation does not occur. The high reversible extensibility and slight increase with the extension of the modulus of elasticity indicate that the chains must be long.
R. C.

Highly polymerised compounds. CLXIV. Unit cell diagrams and micro-structure of "single crystals" of rubber. Determination of the macromolecular lattice of rubber by new X-ray methods. E. SAUTER (Z. physikal. Chem., 1937, B, 36, 405—426; cf. A., 1936, 1327).—The macromol. lattice of rubber is rhombic and has a 12.60 ± 0.05 , c 8.91 ± 0.05 , b 8.20 ± 0.05 Å. and 8 isoprene groups in the unit cell. The four chains of mols. which pass through the unit cell in the direction of the fibre axis are probably trough-shaped and contracted into a columnar form, the double linkings being in *cis* positions. When "melted" rubber crystallises at room temp., due to considerable extension, there is partial separation, crystallites surrounded by a loose amorphous skin being formed. The function of gas-black as filler is to prevent the formation of cryst. regions of appreciable size.

R. C.

Electron diffraction studies of oxides formed on iron. T. IMORI (Nature, 1937, 140, 278).—The regions of stability of FeO, Fe₃O₄, and Fe₂O₃ formed on Fe in air at different temp. and pressures, as determined by electron diffraction, are given. The facts that lower oxides are formed at higher temp. under reduced pressure, and that prolonged exposure increases the scale thickness and not the degree of oxidation, indicate that Fe atoms migrate more vigorously towards the surface with a rise in temp. and inhibit further oxidation of the lower oxides. The transition temp. between γ - and α -Fe₂O₃ lies at approx. 340°, and near this temp. both oxides are formed in an amorphous condition. The change α - to γ -Fe₂O₃ has been effected by maintaining this amorphous α -Fe₂O₃ at 330°.

L. S. T.

Electron diffraction in germanium iodide and stannic iodide vapour. J. A. HVEDING and L. C. STRØMME (Tids. Kjem., 1937, 17, 81—83).—Visual intensity estimates confirm the tetrahedral configurations of GeI₄ and SnI₄.

M. H. M. A.

Molecular structures of the bromomethanes. H. A. LÉVY and L. O. BROCKWAY (J. Amer. Chem. Soc., 1937, 59, 1662—1665).—Electron-diffraction investigation shows that the C—Br distance is 1.91 Å. in each compound; the Br—C—Br angle is 109° 28' in CBr₄, 111° in CHBr₃, and 112° in CH₂Br₂. E. S. H.

Natural magnetism of crystals. F. KRUGER and F. BRASACK (Ann. Physik, 1937, [v], 30, 113—135).—Natural magnetism in crystals of certain structure can be predicted and various types of crystal structure are reviewed. A new method of measuring natural magnetism is described and results are given for two specimens of gypsum of different origin and containing about 0.00015% of Fe. The incompatibility of the existence of natural magnetism and diamagnetic permeability in gypsum is discussed.

W. R. A.

Precise magnetic torque measurements on single crystals of iron. L. P. TARASOV and F. BITTER (Physical Rev., 1937, [ii], 52, 352—360).—With a view of developing magnetic measurements for studying grain orientation of ferromagnetics and to interpret magnetic properties of polycryst. aggregates, magnetic torque curves are obtained for single-

crystal discs. Errors arising from the use of cylindrical discs may be avoided by using ellipsoids. The experimental and calc. curves for a single-crystal ellipsoid of 2.8% Si-Fe are in good agreement.

N. M. B.

Fluctuation phenomena in liquid crystals. H. TROPPER (Ann. Physik, 1937, [v], 30, 371—387).—The variations in brightness of a thin film of the anisotropic phase of *p*-acetoxybenzylideneazine when illuminated with a parallel beam of plane-polarised light and viewed through a Nicol prism in the position of extinction have been recorded by means of a microcine-camera. The effects of temp. and of magnetic field with lines of force parallel to the direction of observation have been investigated. Results are analysed and are shown to be in accordance with the swarm theory of liquid crystals.

O. D. S.

Optical rotation and rotatory dispersion in solution and in the crystalline state. F. M. JAEGER, J. TER BERG, and P. TERPSTRA (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 574—579; cf. this vol. 289).—The $[\alpha]$ of crystals and solutions of *L*-{Co(*d*-chxn)₃}Cl₃·4H₂O and *L*-{Cr(*d*-chxn)₃}Cl₃·3H₂O (chxn = 1 : 2-diaminocyclohexane) have been determined at 4930—6650 Å. At these λ , the crystals are dextrorotatory, but the solutions are dextrorotatory only at some of the shorter λ . The λ of the max. rotation in solution coincides with that of the corresponding crystal. Longchambon's "rule," $[\alpha_{\text{sol.}}]_{\lambda_1}/[\alpha_{\text{cryst.}}]_{\lambda_1} = \text{const.}$, does not apply to these data.

J. G. A. G.

Optical constants of liquid sodium amalgams. A. P. FRIESEN (Physical Rev., 1936, [ii], 49, 414).—With 44 amalgams (0 to 40 at.-% Hg) large changes in $n^2 - k^2$ and in $2nk$ with a change in concn. occur in the region of concns. where so-called intermetallic compounds exist. More or less periodic, small changes also occur where compounds are known not to exist.

L. S. T.

Optics of thin metal films. H. WOLTER (Z. Physik, 1937, 106, 540).—A correction (cf. this vol., 402).

H. C. G.

Optical investigation of thin gold foils. R. SMOLUCHOWSKI (Physical Rev., 1936, [ii], 49, 649).—Measurements on a series of foils, made by condensing Au vapour on glass plates, and varying from "colloidal" foils to well-developed crystal layers, show that the different structures of the foils appear in the shape of the light-absorption curve. The dependence of the observed max. and min. of absorption in the region 4800—6800 Å. on foil thickness and the angle of transmission of the light beam indicates that the origin of these consecutive max. and min. lies in the grain structure of the foils and not in the electronic levels in the metal lattice.

L. S. T.

Reflexion and absorption of light by partially transparent films of silver and aluminium. A. BAXTER (J. Sci. Instr., 1937, 14, 303—306).—Reflexion and absorption coeffs. are measured at normal incidence for films prepared by evaporation in vac. Al is stable and nearly grey at all densities, but Ag films show marked colour selectivity varying with density and age. From the results the two metals

may be compared at any specified density and colour of light. For half-silvering Al always gives the higher reflexion coeff. Reflexion coeffs. of opaque films are given: Al 91 to 93% from blue to red, and Ag 79 to 94% from blue to red. N. M. B.

Effect of occluded hydrogen on the rigidity of metals. J. LYNCH (Nature, 1937, 140, 363).—The rigidity of Pd decreases (up to 23%) when H_2 is occluded. L. S. T.

Effect of reversed deformation on recrystallisation. P. A. BECK (Amer. Inst. Min. Met. Eng., Tech. Publ. 818, 1937, 14 pp.; Met. Tech., 1937, 4, No. 4).—Al single crystals were recrystallised after being bent and straightened. The consumptibility (tendency of the deformed crystals to be consumed by the recrystallisation of new crystals) was decreased for all crystal orientations and deformation vals. were examined. There appears to be no direct physical relation between hardening and recrystallisation.

R. B. C.

Coercive force in single crystals. K. J. SIXTUS (Physical Rev., 1937, [ii], 52, 347—352).—The coercive force of 10 single-crystal discs of Si-Fe was measured in different directions in their planes, and its variation with direction and relation to field direction and crystal axes are discussed. The effect of varying the disc shape and of increasing the internal strains was investigated.

N. M. B.

Energy and lattice spacing in strained solids. G. R. STIBITZ (Physical Rev., 1936, [ii], 49, 862—863).—A relationship between the distortion of the lattice and the potential energy of internal strain in cold-worked crystals is deduced. L. S. T.

Variation of rigidity and of the decrement of torsional vibrations with magnetisation in iron. W. F. BROWN (Physical Rev., 1936, [ii], 49, 863).—From demagnetisation to saturation, the rigidity of annealed material increases approx. 0.26% and Young's modulus approx. 0.30%. Both changes are approx. 50% > before annealing. The decrement of torsional vibrations before annealing varies with magnetisation in a manner similar to that described (*ibid.*, 1934, 45, 742) for longitudinal vibrations.

L. S. T.

Energy of lattice distortion in hard-worked permalloy. F. E. HAWORTH (Physical Rev., 1936, [ii], 49, 863).—The lattice distortion produced by severe cold-working of permalloy (70% Ni) has been investigated by measuring the broadening of the reflexion of the $K\alpha$ doublet by the (311) planes. Broadening decreases on annealing, and recovery is complete at 650°. The energy of distortion in the hard-worked condition is 23×10^6 ergs per $cm.^3$ or 0.068 g.-cal. per g.

L. S. T.

Transition of amorphous to crystalline carbon. M. ÇELEBI (Z. Physik, 1937, 106, 702—708).—Amorphous C prepared from sugar has $\rho = 10^{11}$ ohms per c.c., allowing ϵ (= about 3.9) to be measured in the usual way. κ - T measurements show that transition occurs in the region 600—700°. L. G. G.

State of dislocation of deformed metallic crystals. G. A. HOMES, M. BRUNIN, and P. DUWEZ (Bull. Acad. roy. Belg., 1937, [v], 23, 653—658).—

Deformed metallic crystals are in a state of pre-dissociation, in which the form and individuality are retained whilst the lattices are broken into net blocks which depart more or less from the original orientation. The degree of departure depends on the deforming force, and determines the behaviour of the metal in subsequent recrystallisation. F. J. L.

Evidence for molecular shift in the solid state. J. E. RICCI (J. Amer. Chem. Soc., 1937, 59, 1764—1765).—The evidence quoted by Hahn ("Applied Radiochemistry," New York, 1936) in support of chemical interaction in the solid state is criticised.

E. S. H.

Macroscopic theory of metallic conduction. E. WEBER (Physical Rev., 1936, [ii], 49, 879).—Electric conduction is regarded as analogous to the flow of a viscous compressible fluid in a tube. The theory gives expressions for the resistance change in a magnetic field in agreement with experiment.

L. S. T.

Crystal structure and electric properties. VII. Anisotropy of electrical conductivity in bismuth crystals. O. STIERSTADT (Z. Physik, 1937, 107, 51—63; cf. A., 1935, 567, 1062).—A continuation of earlier work. Each plane in, or straight line through, the crystal lattice possesses sp. anisotropy.

L. G. G.

Diamagnetism of mercury. S. S. BHATNAGAR and M. B. NEVGI (Current Sci., 1937, 6, 53—54).—The val. $\chi = -0.172 \times 10^{-6}$ has been obtained for liquid Hg obtained from pure HgO , $Hg(NO_3)_2$, and $Hg(OBz)_2$. This val. is < that for Hg vapour, probably owing to the existence of polyat. mols. in the liquid state. The at. susceptibility (-34.5×10^{-6}) is approx. = the val. for covalent Hg^{II} .

A. J. E. W.

Diamagnetic susceptibility of some complex ions. S. R. RAO and S. SRIRAMAN (Current Sci., 1937, 6, 54—55; cf. this vol., 20).—Vals. of χ for six ions in solid salts and in aq. solution have been compared in order to examine the effect of ionic deformations. CO_2H' and OAc' show a very small increase in solution; a larger increase is observed with NO_2' , NO_3' , and SeO_3'' , and a decrease with IO_3' . The results for SeO_3'' confirm that Se is sexavalent in solid H_2SeO_3 , becoming quadrivalent in aq. solution.

A. J. E. W.

Paramagnetism of complex chromium salts. L. LEITERER (Z. physikal. Chem., 1937, B, 36, 325—338).—The susceptibilities of $[Cr, 6NH_3]Br_3$, $[Cr, 6NH_3]I_3$, $[Cr, en_3]I_3 \cdot H_2O$, $[Cr, 5NH_3, CNS]Cl_2$, $[Cr, 6CO(NH_2)_2]Cl_3$, and $[Cr, 3C_5H_5N, Cl_3]$ have been measured at 90° and 300° K. The deviations from Curie's law are small ($\theta > 7^\circ$). A graph of θ against the λ of the optical absorption centre is a hyperbola, θ increasing as the absorption shifts towards shorter λ (cf. A., 1933, 336).

R. C.

Domain theory of ferromagnetics under stress. I. W. F. BROWN, jun. (Physical Rev., 1937, [ii], 52, 325—334).—Mathematical. The statistical domain theory is developed in a form applicable to any cryst. or polycryst. ferromagnetic. Formulæ are derived for the magnetisation and strain components and are then specialised to Ni crystals.

Results agree with or correct those of other investigators. N. M. B.

Effect of absorbed hydrogen on the magnetic susceptibility of manganese. M. A. WHEELER (Physical Rev., 1936, [ii], 49, 642—643).—Changes in susceptibility obtained when H_2 is absorbed by Mn at temp. at which the α -, β -, and γ -forms, respectively, are stable are recorded and discussed. L. S. T.

Magnetic susceptibility of oxides of lead. L. WELO and M. PETERSEN (Physical Rev., 1936, [ii], 49, 864).—Measurements of the magnetic susceptibility of the product of vac. decomp. of PbC_2O_4 at 200—300° fail to confirm the view (A., 1932, 132) that reduction of Pb oxide by $NHPh \cdot NH_2$ produces some Pb suboxide. No evidence for the existence of a stable Pb suboxide was obtained. L. S. T.

Temperature variation of the magnetic anisotropy of ammonium nitrate. P. NILAKANTAN (Physical Rev., 1937, [ii], 52, 383—384).—Measurements of anisotropy plotted as a function of temp. confirm the results of X-ray analysis on the temp. variation of crystal structure and the orientation of the ions. Measurements on cooling indicated the existence of a transition lag. N. M. B.

Recent advances in theoretical organic chemistry; behaviour of organic substances in the electric and magnetic field. E. MULLER (Naturwiss., 1937, 25, 545—556).—The theoretical bases of the behaviour of org. substances in an electric or magnetic field and the experimental determination of magnetic susceptibility are discussed. The behaviour of diamagnetic compounds is considered. More extended treatment is given to paramagnetic substances with particular reference to diradicals, metallic ketyls, and vitamin- B_2 (cf. A., 1936, 712, 1370, 1381, 1391, 1396). H. W.

Diffraction of light by ultrasonic waves. S. M. RITOV (Bull. Acad. Sci. U.R.S.S., 1937, Ser. Phys., 223—259).—Theoretical. J. S. A.

Circular ultra-sonic grating in liquids. (Miss) J. ČEROVSKA (Nature, 1937, 140, 425). L. S. T.

Dispersion of sound velocity in liquids. S. PARTHASARATHY (Current Sci., 1937, 6, 55—56; cf. A., 1936, 1189).—The velocity of sound is greater at 14.5 than at 3.5 mc. in C_6H_6 , CCl_4 , and tetrahydronaphthalene. In $C_5H_{11} \cdot OAc$ it is lower at 14.5 mc. PhMe and *m*-xylene give no dispersion. A. J. E. W.

Normal b.p. and critical constants of *n*-heptane. J. A. BEATTIE and W. C. KAY (J. Amer. Chem. Soc., 1937, 59, 1586—1587).— C_7H_{16} has b.p. $98.52 \pm 0.01^\circ$ K. The crit. consts. are T_c $267.01 \pm 0.2^\circ$ K., p_c 27.00 ± 0.02 atm., v_c 0.416 litre per mol., d_c 2.40 mol. per litre. E. S. H.

Specific heat of sodium carbonate by twin calorimeter. M. MATSUI and S. KITAZATO (J. Soc. Chem. Ind. Japan, 1937, 40, 246—248B).—Using a twin calorimeter, the sp. heat of Na_2CO_3 has been found to be $0.2701_4 \pm 0.13\%$ at 25° . R. S. B.

Determination of specific heat of powdered aluminium hydroxide and sodium oxalate. S. I. TSCHERBOV and E. L. TSCHERNIAK (J. Appl. Chem.

Russ., 1937, 10, 1220—1222).—The sp. heat of Al_2O_3 rises from 0.1836 at 20° to 0.2182 at 100° ; that of $Na_2C_2O_4$ is 0.2521 at 0— 100° . R. T.

Heat capacities and entropies of organic compounds. III. Methylamine from 11.5° abs. to the b.p. Heat of vaporisation and vapour pressure. Entropy from molecular data. J. G. ASTON, C. W. SILLER, and G. H. MESSERLY (J. Amer. Chem. Soc., 1937, 59, 1743—1751; cf. A., 1936, 937).—Heat capacity data are recorded; in the range 95— 175° K. solid NH_2Me exhibits hysteresis effects. NH_2Me has m.p. -93.46° , b.p. -6.32° , heat of fusion 1465.8 and heat of vaporisation 6169 g.-cal. per mol., v.p. at 190° K. to the b.p. $\log_{10} P_{mm.} = -(2089.100/T) - 6.05920 \log_{10} T + 2.61668 \times 10^{-4} - 5.47880 \times 10^{-7}T^2 + 25.44187$. The calc. "spectroscopic" entropy is 58.06 e.u. per mol. at 1 atm. and 266.84° K. The mol. entropy of the ideal gas at the b.p. is 56.42 ± 0.3 e.u. The mol. entropies of the superheated liquid and ideal gas at 298.16° K. and 1 atm. are 35.9° and 57.73 e.u., respectively. E. S. H.

Approximate evaluation of the free energy of phenol and cresol. D. ANDREEVSKI (Prom. Org. Chim., 1937, 3, 564—565).—The free energy ΔF of PhOH vapour is given by $-15,130 + 24.95T \times \log T - 0.0194T^2 - 106.62T$, and of *m*-cresol by $-27,346 + 31.25T \log T - 0.02295T^2 - 123.62T$. R. T.

Thermodynamics of gaseous hydrocarbons. K. S. PITZER (J. Chem. Physics, 1937, 5, 752).—Errata (cf. this vol., 398). W. R. A.

Vapour pressures of some hydrocarbons and ketones. L. MAESS and L. VON MUFFLING (Angew. Chem., 1937, 50, 759—761).—V.p. and n_D data are recorded for 11 hydrocarbons and 3 ketones, and compared with lit. vals. The mol. heats of vaporisation and the Trouton quotients (k) are deduced. The mean val. of k is 22.3 and its use permits approx. calculation of the v.p. of hydrocarbons and ketones from the b.p. when the latter is between 60° and 120° . J. W. S.

Limit of superheating and resistance to tensile stress of liquids. W. DORING (Z. physikal. Chem., 1937, B, 36, 371—386).—By the method previously described (A., 1936, 156) the frequency of formation of vapour nuclei in a superheated liquid has been calc. The results show that there is a well-defined temp. limit above which a liquid cannot be superheated and the calc. val. of this limit agrees with existing experimental data. The max. tensile stress to which a liquid may be subjected has also been calc.; the theoretical val. has as yet not been approached experimentally. R. C.

Changes in the density of silver with annealing and cold-working. A. IGATA (Mem. Coll. Sci. Kyoto, 1936, 19, A, 215—222).—The d of cold-rolled Ag is max. when annealed at 200— 300° and min. when annealed at 600— 800° . The variation is due to minute cavities formed between 400° and 600° and destroyed at 600— 900° . The standard d is obtained after successive annealings until there are

very few remaining cavities, followed by cold-rolling, and a final annealing at 250°. $d^{17} = 10.502$.

F. J. L.

Anomalous relation between the specific volume of liquid water and temperature. U. YOSHIDA (Mem. Coll. Sci. Kyoto, 1936, 19, A, 271—277).—The anomalous sp. vol., sp. heat, and viscosity of liquid H_2O are partly explained by assuming the existence of tiny ice crystals with vol. of order of one unit cell.

F. J. L.

Octanes. A. MAMAN (Compt. rend., 1937, 205, 319—321).— d , n , crit. solution temp., and a measure of the resistance to oxidation are given for a no. of isomerides.

F. J. G.

Interaction of vapour molecules with a crystal surface. T. ALTY (Proc. Roy. Soc., 1937, A, 161, 68—79).—By measurement of the rates of sublimation of crystals of I, $C_{10}H_8$, synthetic camphor, and $BzOH$ the coeffs. of condensation for the vapour mol. are deduced.

G. D. P.

Second virial coefficient of argon. K. F. HERZFELD (Physical Rev., 1937, [ii], 52, 374).—The coeff. is calc. from the energy expression for frozen A (cf. A., 1935, 157).

N. M. B.

Cluster theory of imperfect gases. C. F. GOOD-EVE (Nature, 1937, 140, 424—425).—Attention is directed to the possibilities in this theory of explaining the behaviour and properties of gases.

L. S. T.

Range of validity of Nernst's heat theorem. O. REDLICH (Z. Physik, 1937, 106, 539).—A reply to Schmolke's criticisms (this vol., 71).

H. C. G.

Compressibilities of liquid and gaseous normal heptane and an equation of state for gaseous normal heptane. L. B. SMITH, J. A. BEATTIE, and W. C. KAY (J. Amer. Chem. Soc., 1937, 59, 1587—1589).—Compressibilities of liquid C_7H_{16} have been determined for the ranges 30—250° and 7—350 atm., and of gaseous C_7H_{16} for the ranges 275—350° and 1.0—5.0 mols. per litre. The consts. of the Beattie-Bridgeman equation of state have been determined from the data for $d < \text{the crit.}$

E. S. H.

Compressibility of and an equation of state for gaseous propane. J. A. BEATTIE, W. C. KAY, and J. KAMINSKY (J. Amer. Chem. Soc., 1937, 59, 1589—1590).—Compressibility data are recorded for the ranges 96.81—275° and 1.0—10.0 mol. per litre. The consts. of the Beattie-Bridgeman equation have been determined from data below the crit. d .

E. S. H.

The viscosity-temperature function. E. L. LEDERER (Petroleum, 1937, 33, No. 36; Motorenbehr., 2—7).—The mathematics of the η -temp. function are discussed. The second differential η'' is given by $\log \eta'' - a/T - b$, where a has the dimensions of energy, b represents entropy, and T is the abs. temp. This relation represents the facts within the limits of experimental error. As the above cannot be integrated to a finite form, if it is strictly accurate and not merely an approximation, it follows that a finite definition of the η -temp. relation is not possible but that all relations are merely approximations. a is simply related to mol. wt. and its measurement throws

light on the constitution of certain classes of compounds. The bearing of this on Ubbelohde's η -“polhohe” is discussed.

H. C. R.

Theory of the viscosity of liquids as a function of temperature and pressure. R. H. EWELL and H. EYRING (J. Chem. Physics, 1937, 5, 726—736).—An equation for the η of a liquid in terms of the energy of vaporisation (E) and the molal vol. is developed from Eyring's reaction rate theory of η . It is assumed that there is a translational degree of freedom corresponding with flow and that the energy of activation for the elementary flow is $(E)/n$. Spherical mols. have $n = 3$, whilst for non-spherical mols. $n > 3$ and usually = 4. For liquid metals elementary flow is much smaller and of the order of 0.1 to 0.4 of the corresponding (E). Data for η of S confirm the S. ring structure at 160° and suggest that at >250 the mol. consists of long chains containing approx. 36 atoms. Data for long-chain paraffins, water, and other associated mols. are discussed. For increased pressures E must be replaced in the derived equation by $V(p_{int} + p_{ext})$ to give another equation from which either the internal pressure or the η of a liquid under pressure can be computed provided that either is known. Utilising Bridgman's η data, vals. of the internal pressure for some liquids are calc. and agree with internal pressures derived from compressibility data.

W. R. A.

Thermal diffusion of radon gas mixtures. G. E. HARRISON (Proc. Roy. Soc., 1937, A, 161, 80—94).—The diffusion of H_2 -Rn and He-Rn mixtures has been studied by a differential γ -ray method, and the repulsive force index, S_{12} , is evaluated. For H_2 -Rn it is 6.3 and for He-Rn 7.3. Comparison with previous work shows that the Rn mol. must be very “soft.”

G. D. P.

Physico-chemical study of intermetallic molecular solid solutions. N. V. AGEV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 285—319).—Types of solid solutions are discussed in relation to their space-lattice arrangement.

R. T.

Constitution of high-purity iron-carbon alloys. R. F. MEHL and C. WELLS (Amer. Inst. Min. Met. Eng., Tech. Publ. 798, 1937, 41 pp.; Met. Tech., 1937, 4, No. 4).—A series of Fe-C alloys containing 0—1.4% of C was prepared from Fe carburised in dipentene + H_2 and dipentene + C_6H_6 + H_2 . The technique of preparing homogeneous alloys of any desired C content is described. The transformation temp. Ar3, Ac3, Ar1, Ac1, Ac_{cm} and Ar_{cm} of the alloys were determined by dilatometric, thermal, magnetic, and microscopical methods. Information was also obtained relative to the degrees of superheating and undercooling in the metastable Fe-Fe₃C system.

R. B. C.

Equilibrium diagram of the system magnesium-lithium. F. I. SCHAMRAI and P. J. SALDAU (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 349—362).—Mg-Li alloys containing $<5\%$ Li are less corrodible than pure Mg, whilst alloys containing $<15\%$ Li are found to possess satisfactory mechanical properties. The solid solubility of Li in Mg (α -phase) rises from 10 at.-% at 15° to 12.5 at 465°, 19 at 500°,

and 21% at 588° (eutectic). The β -phase (29—95 at.-% Li) consists of solid solutions of $LiMg_2$, m.p. 600°; the compound Li_2Mg_5 is not confirmed. The γ -phase (98—100% Li) is a solid solution of Mg in Li.
R. T.

Equilibrium relations in the nickel-tin system. W. MIKULAS, L. THOMASSEN, and C. UPTHEGROVE (Amer. Inst. Min. Met. Eng., Tech. Publ. 814, 1937, 23 pp.; Met. Tech., 1937, 4, No. 5).—The equilibrium diagram has been obtained by thermal and metallographic methods, and the solubility of Sn in Ni determined by means of X-rays. Conditions for the formation of Ni_3Sn_4 , Ni_3Sn , Ni_4Sn , and Ni_5Sn_2 are indicated. The solid solubility of Sn in Ni is 18.4% at 1100° and 1.6% at 450°.
R. B. C.

Precipitation-hardening of nickel-beryllium alloys. W. GERLACH (Z. Metallk., 1937, 29, 124—131).—Determinations of the magnetic transformation points of Be-Ni alloys quenched from 1000—1200° and annealed to equilibrium at various temp. show that the solubility of Be in Ni increases linearly from 1.5 at.-% at 400° to a max. of 16 at.-% at 1150°; addition of Mn to Be-Ni alloys results in the pptn. of Mn_2Be , which appears to be insol. in solid Ni. Magnetic determinations made during the ageing of quenched Be-Ni alloys indicate that pptn. occurs simultaneously in a heterogeneous manner, proceeding inwards from the grain boundaries, and in a homogeneous manner, proceeding uniformly throughout the grains. Pptn. becomes more homogeneous at const. ageing temp. with increasing degree of supersaturation, and at const. degree of supersaturation with increasing ageing temp. The heat of activation of homogeneous pptn. is 54 kg.-cal. per mol. Max. coercivity is shown by the stable α -phase produced at the beginning of heterogeneous pptn.
A. R. P.

Structure of eutectic alloys; changes produced by rolling and heating. G. TAMMANN and H. HARTMANN (Z. Metallk., 1937, 29, 141—144).—During the solidification of many eutectic alloys, e.g., Zn-Sn, Cd-Sn, and PbSn, the polyhedral crystals of eutectic grow from crystallisation nuclei in such a way that one constituent forms a spherulitic bundle of fibres radiating outwards from the nucleus. Eutectics containing a brittle constituent, e.g., Cu-Cu₂O, Si-Ag, and Sb-Pb, do not show this spherulitic fibrous structure and, unlike those which do, cannot be rolled very far before edge-cracking occurs. On rolling the spherulitic eutectics the fibres bend over in the direction of rolling and eventually become undulating through the sheet produced; subsequent annealing produces a shrinking up of these fibres. Since the rate of crystallisation of a eutectic is < that of its constituents and is the smaller the greater is the no. of these, it should be possible to cool a quaternary eutectic so rapidly that it solidifies in a glassy amorphous state; this has been confirmed by quenching Wood's metal in liquid air.
A. R. P.

General laws of phase transformations in eutectoidal alloys. G. KURDJUMOV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 271—284).—Transformations of supercooled solid solutions involve

two types of reaction: diffusion and crystallisation processes with velocities which \propto temp., and abrupt space-lattice transformations.
R. T.

Theory of construction of diagrams of state of alloys. S. T. KONOBEVSKI (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 255—270).—Theoretical.
R. T.

Rontgenographic and electric investigations of copper-platinum systems. J. O. LINDE (Ann. Physik, 1937, [v], 30, 151—164).—Sp. electrical resistance and lattice dimensions of the Cu-Pt system after three different types of heat-treatments have been exhaustively studied for systems containing approx. 50 at.-% Pt.
W. R. A.

Magnetic properties of iron amalgams. L. F. BATES and P. F. ILLSLEY (Proc. Physical Soc., 1937, 49, 611—618).—The magnetic properties of frozen amalgams prepared by electrolysis have been investigated at -78.5° by the Gouy method. Minute traces of Fe induce ferromagnetic properties. The Fe behaves as if its sp. magnetisation were 130 c.g.s. units as compared with 220 for pure Fe. The increasing paramagnetism of the amalgam with rise of Fe content suggests the presence of a compound.
N. M. B.

Magnetic properties of alloys of iron with iridium. M. FALLOT (Compt. rend., 1937, 205, 517—518; cf. this vol., 509).—The Curie points, α - γ transformation temp., and mean at. moments of alloys with 0—15 at.-% Ir have been determined.
A. J. E. W.

Superlattices. C. S. BARRETT (Met. and Alloys, 1937, 8, 251—256, 260).—A summary.

The superlattice in β -brass. F. W. JONES and C. SYKES (Proc. Roy. Soc., 1937, A, 161, 440—446).—By the use of Zn K radiation, X-ray photographs of β -brass showing superlattice lines have been obtained. It is inferred that β -brass has an ordered at. distribution at room temp.
G. D. P.

Resistance of alloys with disordered and ordered arrangement of atoms. G. BORELIUS (Proc. Physical Soc., 1937, 49, Extra Part, 77—95).—A survey of the interpretation of resistance-concn. curves in relation to the crystal structure of Au-Ag, Au-Cu, and Au-Pt alloys, the transformation from disordered to ordered at. arrangements in relation to concn., heat-treatment, and cold-working, the measurement of degree of disorder, and hysteresis effects.
N. M. B.

Order-disorder transformation. W. L. BRAGG, C. SYKES, and A. J. BRADLEY (Proc. Physical Soc., 1937, 49, Extra Part, 96—102).—A summary of work on order-disorder transformations in alloys, with reference to the nature of the dependence of order on temp., energy changes associated with the formation of the superlattice, the time of relaxation, and the influence of order on magnetic properties.
N. M. B.

An extension of Bethe's theory of order-disorder transitions in metallic alloys. T. S. CHANG (Proc. Roy. Soc., 1937, A, 161, 546—563).—Energy terms are introduced into the theory to represent interactions between nearest neighbours

and also next nearest neighbours in the cubic and body-centred cubic lattices. The resulting sp. heat-temp. relation gives better agreement with experimental vals. than that obtained with the simpler assumptions. The effect of neglecting higher interaction terms does not alter the essential features of the theory. G. D. P.

Heat of formation of some alloys. W. SEITH and O. KUBASCHEWSKI (Z. Elektrochem., 1937, 43, 743—749).—The phase diagrams and heats of formation at room temp. of the systems Pb-Mg, Pb-Li, W-Mg, W-Na, W-Li, and Cd-Na have been determined, together with the heats of formation in the systems Pb-Mg and W-Mg at 860°. The existence of the compounds Mg_2Pb , Na_4Pb , Na_5Pb_2 , Na_2Pb , NaPb , Li_4Pb , Li_3Pb_2 , Li_2Pb , Li_5Pb_2 , LiPb , Mg_3Bi_2 , Na_3Bi , NaBi , LiBi , Li_3Bi , NaCd_2 , NaCd_6 , Mg_2Pb , and Mg_3Bi_2 is indicated. J. W. S.

Critical temperature of water and of aqueous solutions of sodium silicate. N. I. CHITAROV and L. A. IVANOV (Zentr. Min., 1936, A, 46—54; Chem. Zentr., 1936, i, 3655—3656).—Vals. found are: for H_2O 374°, for 0.5N- Na_2SiO_3 , 391.9°; N- Na_2SiO_3 400.8°; 1.2N- Na_2SiO_3 , 402.1°. Gaseous solutions of Na_2SiO_3 containing up to 18 kg. of Na_2SiO_3 per cu.m. may be obtained in the super-crit. region. J. S. A.

Density-pressure-temperature relations of the hydrogen chloride-propylene system in the critical temperature pressure region. Reaction velocity near the critical temperature. C. H. HOLDER and O. MAASS (Canad. J. Res., 1937, 15, B, 345—351).—Measurements of \bar{d} have been made for 2:1 and 1:1 mixtures of HCl and C_3H_6 at 78—115° and 27—115 atm. The 2:1 mixture at 105° and 100 atm., which is above the crit. region, showed only 2.5% reaction in 5 hr., whereas on cooling to 50° 3% reaction occurred in 0.5 hr. R. S. B.

System benzylcellulose-benzene-ethyl alcohol. II. W. L. H. MOLL and G. W. FULLER (Kolloid-Z., 1937, 80, 320—326; cf. this vol., 356).—Data relating to η , structure viscosity, and solubility in the ternary system, and for the heat of mixture and conductivity of C_6H_6 -EtOH are recorded. In 90:10 C_6H_6 -EtOH there is a min. in η and a max. in solubility and surface tension; in the 70:30 mixture the polarisation of EtOH, the \bar{d} and coagulation val. of the solution have max. vals. The results are discussed in relation to dielectric properties. E. S. H.

Solubility of silica dusts. E. J. KING (Nature, 1937, 140, 320).—The amounts of SiO_2 dissolved by 1% NaHCO_3 from quartz and sericite (I) at 37° and 100°, over different periods of time, and by "ascitic fluid" from pptd. SiO_2 , quartz, kaolin, and mica at 37° are recorded. The high results of Emmons and Wilcox (this vol., 484) for (I) in blood-serum are regarded as erroneous, in that the method of centrifuging did not completely remove finely-divided particles from suspension. L. S. T.

Solubility of sodium silicofluoride in aqueous phosphoric acid, and its salting out by sodium chloride. M. TSCHEPPELEVETSKI and C. BOLTZ (J. Appl. Chem. Russ., 1937, 10, 1183—1193).—The

solubility of Na_2SiF_6 rises rapidly with increasing temp., and falls with increasing $[\text{NaCl}]$ and $[\text{H}_3\text{PO}_4]$. Pptn. is incomplete in presence of Al_2O_3 , owing to formation of cryolite. R. T.

Demonstration of a negative temperature coefficient of solubility. L. A. BATEMAN and W. C. FERNELIUS (J. Chem. Educ., 1937, 14, 315).—A solution of $\text{Ce}_2(\text{SO}_4)_3$, saturated at room temp., is heated to 100° in a sealed tube. L. S. T.

Theoretical formula for the solubility of hydrogen in palladium. J. R. LACHER (Proc. Roy. Soc., 1937, A, 161, 525—545).—The theory assumes that H atoms occupy holes in the Pd lattice and leads to a formula indicating the existence of a crit. temp. above which only one solid phase can exist, but below which two phases coexist in equilibrium. Heats of absorption are calc. and pressure-composition isotherms are shown to accord with the experimental facts, and to explain "hysteresis" phenomena exhibited by this system. Hydrides are not formed. The solubility of D_2 is discussed. G. D. P.

Diffusion of hydrogen through nickel and iron. W. R. HAM (Trans. Amer. Soc. Met., 1937, 25, 536—570).—The rate of diffusion (D) agrees with the general equation derived from the kinetic theory on the assumption that it is chemical in nature. A linear relation exists between $\log D$ and $\log P$ (gas pressure) at const. temp. The isotherms for the pure metals have a slope of 0.5. When the metals are not degassed or contain, e.g., C or N in solution, the slope is >0.5 , the increase in slope being approx. \propto amount of impurities present. A linear relation exists between D and $1/T$ if no phase change (crystal structure) or electronic change (e.g., magnetic) occurs. The magnetic change at about 360° and 750° in Ni and Fe, respectively, is clearly indicated by diffusion data. R. B. C.

Effect of pressure and temperature on the occlusion of hydrogen by palladium. E. A. OWEN and J. I. JONES (Proc. Physical Soc., 1937, 49, 587—602).—Using the X-ray method, measurements of the parameter of Pd at 80°, 100°, 120°, 140°, and 160° in an atm. of H_2 at pressures 0—76 cm. Hg have been made. At const. temp. there is a linear relation between the lattice parameter and the pressure for each of the two phases in the system. For dil. solutions of H_2 in Pd the change in parameter varies directly as the pressure and inversely as the square of the temp. The entry of H atoms into the Pd lattice loosens the bonds between the Pd atoms, allowing these to separate more readily under the action of heat. The parameter of pure Pd is $3.8825_6 \pm 0.0003 \text{ \AA.}$ at 20°, and the mean coeff. of thermal expansion in the range 0—300° is 12.7×10^{-6} per degree. N. M. B.

Palladium-hydrogen system. E. A. OWEN and J. I. JONES (Proc. Physical Soc., 1937, 49, 603—610).—The hysteresis observed when the pressure of the gas is taken through a cycle of changes at const. temp. has been examined by the X-ray method. Measurements of the parameter at different pressures, and the appearance and disappearances of the α - and β -phases indicate that the system consists of two

solid solutions at 100° and 120°. The H-rich phase is said to afford evidence of the compound Pd_3H which can dissolve H, whilst the β -phase lattice is always distorted until a temp. well above that necessary to remove H from the Pd is reached. It is suggested that the gas is not in its normal state when it leaves the metal. N. M. B.

Absorption of hydrogen by rhodium. I. E. ADADUROV and N. I. PEVNI (J. Appl. Chem. Russ., 1937, 10, 1216—1219).—Rh does not absorb H_2 at 20—450°/80—323 mm; conflicting results are ascribed to the use of impure Rh. The present observations justify the use of Pt-Rh alloys as catalysts in the oxidation of NH_3 . R. T.

Partial pressures of hydrogen chloride from benzene solutions at 30°. J. H. SAYLOR (J. Amer. Chem. Soc., 1937, 59, 1712—1714).—Direct determinations indicate that HCl is a normal solute in dry C_6H_6 and in C_6H_6 saturated with H_2O . E. S. H.

Sorption of heavy water vapour by active charcoal. K. ARII (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 749—756).—The sorption of D_2O has been studied statically at 20°, 30°, and 50° with sugar charcoal activated at 800°. R. S. B.

Analysis by adsorption of the surface structure of graphite. R. M. BARRER (Proc. Roy. Soc., 1937, A, 161, 476—493).—The sorption isotherms, from 80° to 273° K., have been determined for H_2 , N_2 , and A on Acheson graphite, and heats of sorption are deduced from the data by use of the Clapeyron equation. In each case the heat of sorption is a function of the quantity adsorbed, decreasing rapidly and tending to a limiting val. as the quantity adsorbed increases. The initial val. is regarded as arising from sorption in cracks and the final val. as due to sorption on plane surfaces. Deviations from the Langmuir isotherm are discussed and an alternative expression is derived which gives good agreement with the observations. G. D. P.

Heats of adsorption at -183°: hydrogen on chromic oxide. R. A. BEEBE and H. M. ORFIELD (J. Amer. Chem. Soc., 1937, 59, 1627—1629).—A modified calorimeter is described (cf. this vol., 25). The differential heats of adsorption are initially about 5 kg.-cal. per mol., decreasing to about 3 kg.-cal. per mol. in the later stages of adsorption. The part of the surface for which the heat of adsorption is 3—4 kg.-cal. per mol. is probably the seat of catalytic activity in the reaction between H_2 and D_2 . E. S. H.

Adsorption of oxygen and sulphur dioxide on chromic oxide, after and before poisoning by arsenic. I. E. ADADUROV and N. I. PEVNI (Ukrain. Chem. J., 1937, 12, 317—334).—Adsorption of O_2 by Cr_2O_3 rises, whilst that of SO_2 falls, with rising temp. The catalyst becomes lighter in colour after adsorption of SO_2 , and darker after adsorption of O_2 , pointing to formation of lower and higher oxides, respectively; the process thus involves chemisorption. Sorption of SO_2 is diminished, and that of O_2 increased, by As_2O_3 , which is itself oxidised to As_2O_5 . R. T.

Adsorption of hydrogen on silica gel and glass. L. G. MAIDANOVSKAJA (J. Phys. Chem. Russ., 1935, 6, 1111—1116).—Van der Waals adsorption is found to occur at -183° to 200°, and activated adsorption at 200—500° in the case of both platinised and unplatinised SiO_2 gel. Platinised and unplatinised Pyrex glass gave activated adsorption at 200—500°. The activated adsorption is approx. unimol.

CH. ABS. (e)

Relation of sorption of gases to their molecular structure. K. PETERS and W. LOHMAR (Z. physikal. Chem., 1937, 180, 58—78).—For the adsorption of noble gases and CH_4 on activated C the graph of $\log a$ against $\log p$ (a = amount adsorbed, p = equilibrium pressure) is linear and the adsorption is reversible. The mass of the mol. has a much smaller influence on a than has the mol. structure. For C_2H_6 , C_3H_8 , n - and iso - C_4H_{10} the rate of increase of $\log a$ with $\log p$ falls with increasing p and for a given a the corresponding p on the desorption isotherm is < on the adsorption isotherm. It is inferred that in the adsorption of complex mols. the adsorbed mols. exist in several modifications which differ, e.g., in their orientation on the surface, and that each modification has its own adsorption isotherm, similar to a noble gas. The proportions of the various modifications probably vary with p . The more nearly spherical are the adsorbed mols., the smaller will be the difference between the modifications. In adsorption, p is determined by the mols. held most loosely and in desorption by the mols. held most firmly. R. C.

Corresponding states of gas adsorption. K. PETERS (Z. physikal. Chem., 1937, 180, 79—91).—Existing data for the adsorption of noble gases indicate that in the isotherm $a = \alpha p^{1/n}$ both $\log \alpha$ and $1/n$ are linear functions of the reduced temp. By means of this relation a "reduced" adsorption isotherm has been derived, which contains no individual consts. characteristic of the adsorbate. R. C.

Chemisorption on charcoal. IX. Influence of temperature of activation on sorption of acids and bases. A. KING (J.C.S., 1937, 1489—1491; cf. this vol., 76).—Using HCl, AcOH, BzOH, NaOH, and aq. NH_3 as adsorbates on sugar C (ash 0.02%) activated at different temp. (t), max. base and min. acid adsorption are found for $t = \sim 400^\circ$, and max. acid and zero base adsorption for $t = \sim 850^\circ$. Above 850° base adsorption reappears to a slight extent. The results are ascribed to the formation of sp. surface oxides. F. L. U.

Kinetics of adsorption with interaction between the adsorbed particles. J. K. ROBERTS (Proc. Roy. Soc., 1937, A, 161, 141—153).—Expressions are obtained for the rates of evaporation and condensation when adsorption takes place with and without dissociation. Evidence showing that the adsorbed film of H_2 on W is immobile at room temp. is discussed. The rates of formation of mobile and immobile films are considered numerically. Earlier considerations relating to the mechanism of production of at. H at a hot W surface are not affected

when the effects of interaction between adsorbed particles are included. G. D. P.

Conditioning surfaces for adsorption. I. LANGMUIR and V. J. SCHAEFER (J. Amer. Chem. Soc., 1937, **59**, 1762—1763).—Improved technique is described (cf. this vol. 479). E. S. H.

Adsorption of alkali on charcoal. R. BURSTEIN (Acta Physicochim. U.R.S.S., 1937, **6**, 371—374).—As a result of more accurate measurements a previous statement (cf. A., 1933, 898) that C freed from gas at 950° does not adsorb Na⁺ from 0.01N-NaOH, but that C which has adsorbed H₂ at 300—800° adsorbs alkali equiv. to the adsorbed H₂, is not confirmed. It is now shown that the amount of adsorbed alkali is < the equiv. of the adsorbed H₂. C. R. H.

Exchange adsorption phenomena with calcium oxalate monohydrate. I. M. KOLTHOFF and E. B. SANDELL (J. Amer. Chem. Soc., 1937, **59**, 1643—1648).—At the surface of CaC₂O₄·H₂O exchange of SO₄²⁻, IO₃⁻, or OH⁻ with C₂O₄²⁻ and of Ba²⁺, Mn²⁺, and probably Mg²⁺ with Ca²⁺ occurs, but exchange of Na⁺, NH₄⁺, or H⁺ with Ca²⁺ or of Cl⁻ with C₂O₄²⁻ has not been observed. A saturated solution of CaC₂O₄ in an electrolyte does not contain equiv. amounts of Ca²⁺ and C₂O₄²⁻ when one of the lattice ions undergoes exchange at the surface with one of the ions of the electrolyte. The inequality increases with the amount of surface exposed. The mechanism of exchange is discussed. The distribution of Ca²⁺ and C₂O₄²⁻ between CaC₂O₄·H₂O and solution has been expressed quantitatively, and the distribution coeff. and the no. of mols. of surface C₂O₄²⁻ per g. of solid have been calc. E. S. H.

Hysteresis of water vapour on cellulose. Influence of air. F. WALKER, W. B. CAMPBELL, and O. MAASS (Canad. J. Res., 1937, **15**, B, 340—344).—Dry cellulose was exposed at 28° to H₂O vapour from ice at 0° (pressure *p*), then to saturated H₂O vapour, and finally to pressure *p* of H₂O. The difference in H₂O content at pressure *p* before and after saturation was independent of the pressure of air at 10⁻²—10⁻⁵ mm. R. S. B.

Absorption of fats and dialysis of fatty acids. F. L. BREUSCH (Biochem. Z., 1937, **293**, 280—294; cf. von Kuthy, A., 1931, 1125).—The solubility of saturated C₁₀, C₁₂, C₁₄, and C₁₆ fatty acids in solutions of salts of bile acids increases as the mol. wt. of the acids decreases. The dialysis of fatty acids and their salts and of lecithin through Cellophane and parchment has been studied. W. McC.

Surface tension of strong electrolytes. M. DOLE (Nature, 1937, **140**, 464—465).—An expression for γ has been obtained by postulating a small no. of surface regions where negative ions may be adsorbed from the interior of the solution with a large diminution of potential energy. It gives vals. for KCl in agreement with those found experimentally, including the observed decrease in γ at low concns. L. S. T.

Surface phenomena in the crystallisation of supercooled liquids in thin layers. I. G. L. MICHNEVITSCH, J. F. BROVKO, and A. B. BADADSHAN (Acta Physicochim. U.R.S.S., 1937, **6**, 455—472).—

The distribution of crystallisation nuclei on supercooling thin films of betol, together with the variations produced by supercooling in an electric field normal and parallel to the layers, have been examined. C. R. H.

Properties of adsorbed films with repulsive interaction between adsorbed atoms. J. S. WANG (Proc. Roy. Soc., 1937, A, **161**, 127—140).—The method employed by Peierls and Bethe in the treatment of order-disorder phenomena is applied to adsorption with positive interaction energy between neighbouring adsorbed atoms. The case of a diat. gas dissociating on adsorption is considered. It is shown that crit. conditions do not occur. Heat of adsorption is calc. in terms of the fraction of surface covered for various interaction energies. An equation analogous to the Clausius-Clapeyron equation is derived for the case of adsorption with dissociation. G. D. P.

Properties of caesium and oxygen films on tungsten. J. B. TAYLOR and I. LANGMUIR (Physical Rev., 1936, [ii], **49**, 878—879).—O films prepared by allowing O₂ at 10⁻⁶—10⁻¹⁰ mm. pressure to diffuse through a heated Ag tube on to a W filament require no activation to produce increased electron emission when Cs is adsorbed on them. O-W films undergo a rearrangement when heated in presence of adsorbed Cs, with accompanying changes in electron emission from the Cs-O-W film. In these films [O] corresponds with a single layer and the heat of evaporation of the O increases from 143—168 kg.-cal. as [O] approaches 0. At pressures < 10⁻⁷ mm., O diffuses into W at temp. as low as 1200° K. A preliminary val. for the heat of diffusion is 83 kg.-cal. L. S. T.

Polarimetric studies of oxide film formation on metals. A. B. WINTERBOTTOM (Nature, 1937, **140**, 364—365).—Curves showing the changes in the relative phase retardation of polarised light falling on Cu mirrors during heating and cooling in H₂ and air are reproduced, and the corresponding film thicknesses of oxide have been calc. The magnitude of the first rapid oxidation is that expected on the basis of a sorption-diffusion oxidation theory. L. S. T.

Viscosity of unimolecular films. W. D. HARKINS and R. J. MEYERS (Nature, 1937, **140**, 465).—Two methods of measurement are described. Data for the higher fatty acids (C₁₄—20) show that η increases rapidly with the length of the mol. L. S. T.

Determination of the specific surface of barium sulphate. I. M. KOLTHOFF and W. M. MACNEVIN (J. Amer. Chem. Soc., 1937, **59**, 1639—1643).—Three methods are described. The simplest is based on the determination of the amount of wool-violet adsorbed in the saturated surface of BaSO₄. Good results are also obtained by a procedure based on the exchange between CrO₄²⁻ and SO₄²⁻ in the surface of BaSO₄. The radioactive method, using Th-B, is limited to well-aged specimens of BaSO₄. E. S. H.

Orientation in films of long-chain esters. A. E. ALEXANDER and J. H. SCHULMAN (Proc. Roy. Soc., 1937, A, **161**, 115—127).—Differences found in

the rate of hydrolysis of films on N-NaOH solution are ascribed to differences in the orientation of the component parts of the mols. Inhibition of hydrolysis is due to the protective sheath of short hydrocarbon chains. In agreement with previous results, the work of compression of the short chain to a position beneath the surface increases by a nearly const. amount for each CH_2 group added. The effect of mol. configuration on the vertical component of the apparent dipole moment is discussed. G. D. P.

Multilayers of sterols and the adsorption of digitonin by deposited monolayers. I. LANGMUIR, V. J. SCHAEFER, and H. SOBOTKA (J. Amer. Chem. Soc., 1937, 59, 1751—1759).—Monolayers of several sterols, cholesterol (I), cholestanol (II), and the corresponding episterols, ergosterol (III), and calciferol (IV), can be built up as multilayers on Cr plates. The thickness per monolayer (16.6—17.9 Å.) agrees with that found by X-ray analysis for 3-dimensional crystals. Digitonin (V) is adsorbed as a visible film (up to 30 Å.) from a 0.001M solution on monolayers of (I), (II), and (III), but only slightly on monolayers of the episterols or (IV). A similar specificity is observed in the pptn. of the sterols by (V). Penetration of (V) between the sterol mols. of a monolayer causes an expansion to about double the area. The episterols give rapidly expanding liquid films, and the normal sterols slowly expanding, very rigid films; the former are hydrophobic, and the latter hydrophilic and more stable. E. S. H.

Spreading and expansion phenomena of unimolecular layers [of protein]. G. T. PHILIPPI (Chem. Weekblad, 1937, 34, 626—633).—An apparatus is described for studying the properties of unimol. films by measurements of surface pressure and change in vol. with a travelling Po electrode; the apparatus has been used in the investigation of the spreading properties and the structure of protein films. Experiments with ovalbumin, serum-albumin, lactoglobulin, insulin, and pepsin show that they all possess approx. the same characteristic surface, about 1 sq. m. per mg., which is independent of the p_H of the substrate; since the surface for the NH_2 -acid residues is also roughly const. at 21—22 Å.², it would appear that the films are homogeneous. The latter are “dehydrated” when compressed to an area of 0.9—1.0 sq. m. per mg. Each protein mol. is surrounded by a unimol. H_2O layer. Protein films are considered as homogeneous, unimol. layers of polypeptides. The side-chains in the peptide mol. lie on both sides of the layer and the peptide groups in the expanded film are associated. Since the films consist of three layers, an upper non-polar layer having hydrocarbon characteristics, a middle layer of associated peptide groups, and a lower layer of polar groups, they may be conveniently termed “triplex films.” The surface potential and the film pressure vary considerably with the p_H and the salt content of the substrate, the p_H curve being highly characteristic for all proteins. The electrical properties of such films are discussed in some detail. Ovalbumin forms a macroscopic coherent film under certain conditions but this is not

the case with serum-albumin. Protein films are very elastic. S. C.

Highly polymerised compounds. CLXVII. Influence of temperature on osmotic pressure of solutions of substances of high mol. wt., and their molecular state. G. V. SCHULZ (Z. physikal. Chem., 1937, 180, 1—24).—The osmotic pressure, P , of 1—3% solutions of cellulose nitrate in COMe , and of polystyrene in PhMe rises with the temp., θ , more slowly than it would if $\propto \theta$, indicating the absence of appreciable association. Differential heats of dilution, calc. from the variation of p with θ , are positive. As the concn. approaches zero the solutions approximate to ideal dil. solutions. Over the above concn. range the solutions follow the osmotic pressure equation for “regular” solutions more closely than the ideal van t' Hoff equation, but the deviations from the latter are due to the non-ideal character of the entropy as well as to solvent-solute interaction. The results cannot be reconciled with the view that the osmotic pressure of solutions of substances of high mol. wt. is increased by intramol. Brownian movement (cf. A., 1935, 579). R. C.

Cryoscopic studies on bases in sulphuric acid: ionisation of di-ortho-substituted benzoic acids. H. P. TREFFERS and L. P. HAMMETT (J. Amer. Chem. Soc., 1937, 59, 1708—1712).— PhNO_2 is incompletely ionised in H_2SO_4 . Completely ionised non-acid bases (e.g., COPh , BzOH) exhibit small deviations from ideal behaviour. A new type of reaction with H_2SO_4 , involving the formation of acyl ions of the type RCO^+ as well as RCO_2H_2^+ , has been observed with 2:6- $\text{C}_6\text{H}_3\text{Me}_2\cdot\text{CO}_2\text{H}$ and two of its derivatives. E. S. H.

Properties of electrolytic solutions. XX. F.p. of solutions of electrolytes in benzene. D. A. ROTHROCK, jun., and C. A. KRAUS (J. Amer. Chem. Soc., 1937, 59, 1699—1703; cf. A., 1935, 561).—Modified apparatus is described. Results for $\text{NH}_4\text{B}_3\text{picrate}$ and iodide and NBu_4ClO_4 (0.001—0.02N) in C_6H_6 show marked association; those for the picrate agree with a mass action equilibrium between dipoles and quadripoles at all concns. A dipole-quadrupole equilibrium holds for $\text{NH}_4\text{B}_3\text{I}$ at low concns., but at higher concns. more complex structures are formed; two types of quadripoles must be assumed to be formed. With $\text{NH}_4\text{B}_3\text{ClO}_4$ highly complex structures are formed even at low concns. E. S. H.

Diamagnetic susceptibilities of dissolved and hydrated salts. F. E. HOARE and G. W. BRINDLEY (Proc. Physical Soc., 1937, 49, 619—623; cf. this vol., 131).—Available data show that the effective susceptibilities (χ) for the ions in aq. solutions of salts are additive within 1%. Systematic differences are shown by the vals. of χ for ions in solution and in crystals. For small univalent ions and all bivalent ions the solution vals. are smaller, whereas these are greater for large univalent ions. New measurements of χ are recorded for hydrated MgCl_2 , CaCl_2 , BaCl_2 , SrBr_2 , and BaBr_2 , and a comparison of data obtained by three different methods shows that the vals. of χ derived from hydrated crystals by assuming the H_2O of hydration to have the same χ as ordinary

H₂O, approximate more closely to the vals. for salts in solution than to the vals. afforded by the anhyd. salts.

N. M. B.

Colloidal gases. IV. Preparation and properties of colloiddally dispersed gases and their significance in nature and industry. A. KRAUSE and K. KAPITANCZYK (Kolloid.-Z., 1937, 80, 273—286; cf. A., 1935, 699).—The prep. of sols of air, O₂, N₂, H₂, CO, CH₄, C₂H₄, and C₂H₂ in conc. aq. NaOH is described. The conc. sols. are stable for some hr. at 5°, and the stability is increased by dilution, lowering of temp., or addition of protective colloids. The particle sizes of the dispersions have been determined; with O₂, N₂, CH₄, and air, gas particles of 2.9—4.6 μ . diameter are observable in the ultra-microscope owing to the great difference in n of the two phases. The Brownian movement and Tyndall effect have been examined. The colours of the sols vary with increasing particle size from green through yellow and pink to white. The production of foams from conc. aq. NaOH and H₂O₂ is discussed.

E. S. H.

Nucleus formation on ions in supersaturated vapours. T. GLOSIUS (Kolloid.-Z., 1937, 80, 269—273).—The rate of formation of liquid droplets in air, supersaturated with H₂O by sudden expansion, has been deduced theoretically and tested experimentally.

E. S. H.

Theory of lyophilic colloids. S. M. LIEFATOV (Uspechi Chim., 1935, 4, 933—957).—A review.

CH. ABS. (*e*)

So-called longitudinal scattering of light. M. KATALINIĆ (Z. Physik, 1937, 106, 439—452).—Measurements of the scattering of light through small angles by single particles of a mono-disperse colloidal solution or suspension are reported. The haloes given by single particles in H₂O distilled under various conditions are discussed.

H. C. G.

Precipitation of ferric hydroxide, especially at temperatures above 100°. T. KATSURAI (Kolloid.-Z., 1937, 80, 291—294).—The hydrolysis of FeCl₃ in presence of NaCl or BaCl₂ at <100° in an autoclave has been studied. At 120—140° the sediment vol. decreases with increasing concn. of the added salt. The light absorption and turbidity of mixtures of aq. FeCl₃ with varying concns. of NH₃ have been determined; max. turbidity is observed at medium [NH₃], and for λ 615 μ . the Lambert-Beer law holds. The max. sediment vol. is obtained with the mixture of max. turbidity at room temp.

E. S. H.

Coagulation of colloids. XVIII. Zonal effect and antinormal change of opacity during the slow coagulation of colloidal manganese dioxide. S. S. JOSHI and P. V. J. RAO (J. Indian Chem. Soc., 1937, 14, 388—394; cf. this vol., 410).—The change of opacity with time has been studied with colloidal MnO₂ coagulated with KCl, AcOH, and BaCl₂. Opacity and degree of coagulation do not necessarily run parallel, and in the later stages of coagulation there is a decrease in opacity. Low [KCl] gives a decrease in opacity from the start. The opacity curves are broken up into "zones" by discontinuous changes, especially for medium concn. of the coagulant.

R. S. B.

Electrolytic coagulation of weakly solvated sols and electrolyte activity. VIII. Determination of exact coagulation values by turbidity measurements. II. Measurements in the infra-red with the photo-cell. H. A. WANNOW and K. HOFFMANN. IX. Theory of Burton's rule. Wo. OSTWALD (Kolloid.-Z., 1937, 80, 294—304, 304—315; cf. A., 1936, 1200).—VII. The measurement of turbidity of dil. sols from the intensity of scattered light and of conc. sols from the intensity of transmitted light is described and results are reported for As₂S₃ sols containing varying amounts of pptg. electrolytes. The change in intensity of transmitted light with time after adding an electrolyte is parabolic; the decrease in intensity with increasing concn. or activity coeff. of the added electrolyte gives an S-shaped curve. The turning-point of this curve is considered to afford a better measure of coagulation val. than that given by an arbitrary standard turbidity.

IX. Published data on the coagulation of different sols by electrolytes are in accordance with the theories developed by Ostwald.

E. S. H.

Formation of Liesegang rings in the precipitation of basic mercuric chloride in the absence of a gel. B. N. SEN (Z. anorg. Chem., 1937, 234, 63—64).—When aq. Na₂B₄O₇ is carefully poured onto aq. HgCl₂ in a narrow tube rings of ppt. are formed.

F. J. G.

Protective colloids, protalbinic and lysalbinic acids.—See A., II, 448.

Ageing of fresh precipitates. XIV. Ageing of silver chloride as indicated by the speed of penetration of bromide ions into the solid. I. M. KOLTHOFF and H. C. YUTZY (J. Amer. Chem. Soc., 1937, 59, 1634—1639; cf. this vol., 363).—The speed of penetration of Br⁻ into pptd. AgCl is not determined solely by the rate of recrystallisation; on the other hand it gives an indication of the rate of ageing during the early stages. Gelatin and wool-violet retard, but do not prevent, the penetration.

E. S. H.

Dilatation of gelatin under the influence of salts. J. H. C. MERCKEL and E. H. WIEBENGA (Kolloid.-Z., 1937, 80, 315—319).—The degree of swelling of gelatin in aq. Na salt solutions at p_H 3.75 has been determined and a bilinear relation between the salt concn. for a given amount of swelling and the lyotropic no. is derived.

E. S. H.

Effect of alcohols on the time of set of alkaline silica gels. L. A. MUNRO and C. A. ALVES (Canad. J. Res., 1937, 15, B, 353—359).—The setting time is reduced considerably by MeOH, EtOH, PrⁿOH, PrⁱOH, BuⁿOH, BuⁱOH, sec.-BuOH, Bu^tOH, and COMe₂, and slightly by glycol, whilst it is increased by glycerol. The associated changes are discussed. The effects show an approx. parallelism with the dielectric consts. of the alcohols, but several anomalies are pointed out.

E. S. H.

Crystallisation of iodine and iodides in gels. M. A. MILLER (Kolloid.-Z., 1937, 80, 327—333).—Published work is reviewed.

E. S. H.

Base exchange in casein. E. GRAF (Kolloid-Beih., 1937, 46, 229—310).—The structure of the

casein (I) micelle is elastic but its exchange reactions qualitatively resemble those of permutit. It possesses a metastructure and exhibits intramolecular exchange properties. Electrometric titration indicates a base-fixing capacity of 1.6 m.-equiv. per g. of (I). Swelling of (I) diminishes the force of attraction for adsorbed cations and facilitates base exchange. In EtOH-H₂O solution (I) shows neutral salt adsorption effects which increase with the proportion of EtOH used. In EtOH solutions increasing concns. of exchangeable ions lead to dispersion of (I). CH₂O-(I) in the dehydrated condition has exchange properties similar to those of (I) but in aq. dispersion the exchange capacity is < that of (I); this is attributed to its smaller swelling capacity. A. G. P.

Dispersion temperature of an intracellular protein, ascaridin. E. FAURÉ-FREMIET and J. FILHOL (J. Chim. phys., 1937, 34, 444—451).—Ascaridin (I) dissolves reversibly in H₂O at 50—51°. KCl is without effect, but, in general, added salts raise or lower the dispersion temp. θ , specifically and to an extent \propto salt concn. For K salts, the θ vals. are in the order: citrate > SO₄' > OAc' > Cl' > Br' > I' > CNS'. (I) is transformed into an insol. form, and this change is fairly rapid in solution at high temp. X-Ray examination shows that (I) exists in an amorphous and a semi-cryst. form. The above changes of (I) are compared with the thermoelastic transformation of elastoidin. J. G. A. G.

Cyclol hypothesis and the "globulin" proteins.—See A., II, 475.

Measurement of depolarisation of Tyndall light with solutions of proteins, particularly fibrinogen.—See A., III, 412.

Coacervation. H. G. B. DE JONG (Kolloid-Z., 1937, 80, 221—231, 350—360).—A review of published work. E. S. H.

Thixotropic viscosity. S. A. GLIKMAN (J. Phys. Chem. Russ., 1935, 6, 511—512).—The term has reference to the variable η connected with the presence of elements of gel-like structure in the sol.

CH. ABS. (e)

Dissociation constants of organic acids. XIX. Unsaturated acids. W. L. GERMAN, G. H. JEFFERY, and A. I. VOGEL (J.C.S., 1937, 1604—1612; cf. this vol., 135).—True dissociation const. have been calc. from conductivity measurements, and from the results of potentiometric titration, for acrylic, trans-crotonic, β , β -dimethylacrylic, tetrolic, furoic, and glutaconic acid. Evidence for the *trans*-configuration of glutaconic acid, m.p. 138°, is afforded by the similarity of K_1/K_2 and of the titration curves to those for fumaric acid. F. L. U.

Basic strengths of tertiary amines, phosphines, and arsines. W. C. DAVIES and H. W. ADDIS (J.C.S., 1937, 1622—1627).—Dissociation const. of bases in 30% or 50% EtOH have been determined at 20°, for NPhMe₂, alone and with various nuclear substituents, NPhEt₂, PPhMe₂ and derivatives, and mesityldimethylarsine. The strengths of comparable bases are in the order phosphine > amine > arsine. Me in the *o*-position increases the strength of a given base, and Et₂ are stronger than Me₂ bases (N and P).

The effects of nuclear substituents are generally weaker in phosphines than in amines. The velocity coeff. for the reaction with MeI increases with the dissociation const. of the base within the group of amines, but this rule does not hold when comparing together amines, phosphines, and arsines. F. L. U.

Biologically active 4-ketohexuronic acids (ascorbic and isoascorbic acids).—See A., III, 440.

Individual activity coefficients of ions in aqueous solutions. J. KIELLAND (J. Amer. Chem. Soc., 1937, 59, 1675—1678).—The activity coeffs. of 130 inorg. and org. ions in H₂O at different ionic concns. have been calc. from published data and tabulated. E. S. H.

Activity coefficients of cadmium iodide. R. G. BATES and W. C. VOSBURGH (J. Amer. Chem. Soc., 1937, 59, 1583—1585).—Activity coeffs. for CdI₂ in H₂O (from 0.001M to saturation) have been derived from e.m.f. data for the cell Cd(Hg)|CdI₂(m)|CdI₂(m), Hg₂I₂|Hg. E. S. H.

Application of the phase rule to crystal systems. D. BALAREV (Monatsh., 1937, 71, 30—45).—The pressure-temp. relations for several reactions of the type A (cryst.) B (cryst.) + C (gas) have been determined and the results are discussed in terms of the phase rule. The gas pressure at a given temp. is influenced by the no. of points of contact and the orientation of the crystal phases. E. S. H.

Extension of Schreinemakers' method to multi-component systems. F. PERELMAN (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 379—386).—Graphical methods are described (cf. A., 1893, ii, 260). R. T.

Measurement of transition points of electrolytic iron by hydrogen diffusion. W. R. HAM (Physical Rev., 1936 [ii], 49, 643).—Diffusion of H₂ provides a sensitive and accurate means for the determination of transition points of metals. With Fe, the transition at 900° results in a large change in diffusion rate. The break is abrupt and independent of [H₂] over a range corresponding with H₂ pressures of 10—73 cm. of Hg. L. S. T.

Compound formation in the binary systems Ba(NO₃)₂-KNO₃ and Ba(NO₃)₂-NaNO₃. J. E. RICCI (J. Amer. Chem. Soc., 1937, 59, 1763—1764).—Published data show that these systems, hitherto represented as of the simple eutectic type, are characterised by the compounds 2Ba(NO₃)₂.KNO₃, 2Ba(NO₃)₂.NaNO₃, and probably Ba(NO₃)₂.2KNO₃. E. S. H.

Vapour pressure of water over fused sodium and potassium hydroxide. A. M. BAUMAN (J. Appl. Chem. Russ., 1937, 10, 1165—1172).—The *v.p.* of H₂O has been determined in the systems MOH-H₂O, MOH-H₂O-M₂CO₃, and MOH-M₂CO₃-MCl-H₂O, at 300—380° (M = Na or K). R. T.

Sodium vapour potential and the Gay Lussac reaction. O. BARTA (Z. Elektrochem., 1937, 43, 733—743).—From e.m.f. data for the cells C + Na (gas)|Na₂CO₃|O₂; Na (gas)|Na₂CO₃|O₂; Na (liq.)|Na₂CO₃|O₂; and Na (liq.)|Na₂O (solid)|O₂ the const. of the Gay Lussac reaction Na₂CO₃ + 2C = 2Na +

3CO have been evaluated and compared with manometric observations. The dissociation const. of Na_2CO_3 is deduced. The energy of formation and entropy of Na_2O calc. from the data are in accord with the vals. deduced from the Na_2O cell.

J. W. S.

Physico-chemical analysis in connexion with nitric acid treatment of phosphates. II. Solubility of calcium nitrate in aqueous nitric acid. A. P. BELOPOLSKI and V. V. URUSOV (J. Appl. Chem. Russ., 1937, 10, 1178—1182).—The solubility of $\text{Ca}(\text{NO}_3)_2$ (I) and of its dihydrate falls rapidly with increasing $[\text{HNO}_3]$; (I) is the only solid phase separating in presence of $>1.46\%$ HNO_3 at 50° , whilst with $<1.46\%$ HNO_3 the di- and tri-hydrate (II) are formed. (II) melts congruently at 51.1° , and has a closed field of crystallisation, between 74 and 77% (I) and 0—1% HNO_3 .

R. T.

Physico-chemical study of the solubility of caffeine in [aqueous] sodium benzoate. M. CHAMBON, J. BOUVIER, and P. DURON (J. Pharm. Chim., 1937, [viii], 26, 216—231).—The system caffeine- NaOBz - H_2O has been studied at temp. between 37° and 90° . The equilibrium data are said to afford evidence of the existence of compounds which contain caffeine and NaOBz in the ratios 1 : 1 and 1 : 2.

J. L. D.

Ternary systems: water-*m*-cresol-benzene and -toluene. Determination of water content of *m*-cresol. F. F. RATMAN (J. Appl. Chem. Russ., 1937, 10, 1233—1236).—The phase diagrams of the systems are identical. The H_2O content y of *m*-cresol is determined by adding 0.16 g. of H_2O to 5 ml. of *m*-cresol, followed by C_6H_6 from a burette until there is permanent turbidity, when $y = 18/(x + 2)^{\frac{1}{2}} - 0.03x + 0.0025x^2 - 0.00003x^3 - 3.2$, where x is the vol. of C_6H_6 added.

R. T.

Heat of formation and specific heat of aluminium carbide. S. SATOH (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 757—764).—The mean sp. heat (c) of Al_4C_3 has been determined at 0—99.6°, 0—244°, and 0—320.5°, and is given by $c = 0.2282 + 2.12 \times 10^{-4}t - 2.842 \times 10^{-6}t^2$. The heat of formation of Al_4C_3 , calc. from equilibrium data for the reaction $4\text{AlN} + 3\text{C} = \text{Al}_4\text{C}_3 + 2\text{N}_2$, is 63,200 g.-cal.

R. S. B.

Conductivity and p_H values of calcium hydroxide solutions at 25° . F. M. LEA and G. E. BESSEY (J.C.S., 1937, 1612—1615).

F. L. U.

Conductance of potassium ferrocyanide solutions. C. W. DAVIES (J. Amer. Chem. Soc., 1937, 59, 1760—1761).—The results of Jones and Jelen (this vol., 138) are interpreted in terms of ion association.

E. S. H.

Influence of strong electrolytes and mercuric chloride on the conductivity of aqueous benzoic acid. S. S. JOSHI and D. N. SOLANKI (J. Indian Chem. Soc., 1937, 14, 323—343).—The sp. conductivity (κ) of 0.01N—0.005N aq. BzOH has been determined at 25° in presence of N/64—N/4096 LiCl , NaCl , KCl , RbCl , CsCl , BaCl_2 , HCl , and HgCl_2 . κ is additive except for HCl and HgCl_2 , and hence there is no influence of neutral salts on the degree of dissociation

of BzOH . The decrease of κ in presence of HCl is due to the common ion effect, and in presence of HgCl_2 at high dilution to hydrolysis of the salt. The dissociation const. of BzOH is 6.24×10^{-5} at 25° .

R. S. B.

Relation between electrical conductivity and viscosity of fused salts. J. FRENKEL (Acta Physicochim. U.R.S.S., 1937, 6, 339—346).—Theoretical. The recent extension of Walden's rule, connecting electrical conductivity, κ , and η of ionic solutions, to a general law which can be expressed by $\kappa^m \eta = \text{const.}$, is explained on the basis of the author's theory of the nature of thermal energy in the liquid state (cf. A., 1936, 1189).

C. R. H.

Transference numbers and ion mobilities of electrolytes in deuterium oxide and its mixtures with water. L. G. LONGSWORTH and D. A. MAC-INNES (J. Amer. Chem. Soc., 1937, 59, 1666—1670).—In solutions of KCl and H(D)Cl in H_2O — D_2O mixtures the conductance of Cl^- varies almost linearly with the mol. fraction of D_2O . The corresponding curve for the H(D)^+ component is complex. Limiting vals. of the ion conductances in D_2O have been computed from data for solutions of NaCl , KCl , and H(D)Cl at different concns. in nearly pure D_2O .

E. S. H.

Influence of parchment paper membranes on the transport of electrolyte in 0.1N-hydrogen bromide. A. WAGNER (Chem. Listy, 1937, 31, 313—317).—The Hittorf transport no. of H^+ in 0.1N- HBr is 0.815 in absence, and 0.833 in presence, of a parchment paper diaphragm.

R. T.

Transport measurements with cuprous oxide. J. GUNDERMANN and C. WAGNER (Z. physikal. Chem., 1937, B, 37, 155—156).—The transport no. of the Cu^+ ion at 1000° is 5×10^{-4} , independent of the O_2 pressure, p . The partial conductivity due to the Cu^+ ion is approx. $\propto p^{1/7}$. These results confirm the theory previously advanced (A., 1933, 887).

R. C.

Effect of the speed of rotation on the electrode potentials of copper and zinc. C. G. FINK and H. B. LINFORD (Trans. Electrochem. Soc., 1937, 72, Preprint 9, 147—155).—Measurements of the cathode potential of Cu in aq. CuSO_4 and of Zn in aq. ZnSO_4 indicate a change of potential in the positive direction when the cathode is rotated, the magnitude of the change depending on the ionic concn. of the electrolyte and speed of rotation. The max. effect occurs at approx. 8000 r.p.m.

J. W. C.

Attempted use of crystals as calcium electrodes. R. S. ANDERSON (J. Biol. Chem., 1936, 115, 323—326).—Attempts to determine $[\text{Ca}^{++}]$ potentiometrically, using crystals of CaCO_3 or CaF_2 as electrodes, failed because of the high electrical resistance. The work of Tendeloo (A., 1936, 443) is criticised.

E. S. H.

Attempted use of crystals as calcium electrodes. II. R. S. ANDERSON (J. Amer. Chem. Soc., 1937, 59, 1420—1422; cf. preceding abstract).—Further experiments on the measurement of e.m.f. of concn. cells by CaCO_3 or CaF_2 electrodes are inconclusive.

E. S. H.

Nature of the glass electrode potential. II. Effect of water on the potential of the glass electrode. H. YOSHIMURA (Bull. Chem. Soc. Japan, 1937, 12, 359—366; cf. A., 1936, 682).—The deviation of $\Delta E/\Delta p_H$ from the theoretical val. decreases when the electrode is submerged in H_2O and attains a const. val. in a week. Thereafter, if one side is drier than the other, a difference of potential is exhibited, but this can be explained by the theories of Dole (A., 1935, 170), Gross and Halpern (A., 1934, 601), and Lark-Horovitz (A., 1931, 546). F. R. G.

Mode of action of the glass electrode. G. HAUGAARD (Tids. Kjemi, 1937, 17, 87—88).—Comparison of the variation with time of base exchange and electrode potential of glass in contact with 0.1N-HCl shows that the glass electrode is a H_2 electrode the $[H_2]$ of which has not reached equilibrium. M. H. M. A.

Glass electrode and its applications. I. K. MARUYAMA and H. HAGISAWA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 737—748).—The asymmetric p.d. of Haber glass electrodes has been measured by a vac.-tube potentiometer. The titration of H_2SO_4 in presence of $KMnO_4$, $K_2Cr_2O_7$, $KClO_3$, $KBrO_3$, KIO_3 , and $CuSO_4$, and of HNO_3 , $H_2Cr_2O_7$, and H_2SO_3 has been studied. R. S. B.

Glass electrode. I. Glass electrode errors at 30°. II. Properties of lithium glass electrodes. J. L. GABBARD and M. DOLE (Trans. Electrochem. Soc., 1937, 72, Preprint 18, 249—256).—I. Errors in the use of ordinary glass electrodes are tabulated and compared with results of other authors.

II. The results of Sokolov and Passinski (A., 1932, 915) with Li glass electrodes could not be reproduced and the electrodes failed to function accurately even in the neutral p_H range. F. R. G.

Oxidation-reduction potential of the system oxalacetic acid-l-malic acid. K. LAKI (Z. physiol. Chem., 1937, 249, 63—70).—In suspensions of pigeon breast muscle oxalacetic acid inhibits the action of succinic dehydrogenase and hence interference by fumarate with the electrometric determination of the oxidation-reduction potential of the system oxalacetic acid-l-malic acid does not occur. At p_H 7.0 and 37° the potential is -0.169 ± 0.009 v. W. McC.

Electrolytic reduction potentials of organic compounds. XXIV. XXV. Standard electrolytic reduction potential and redox potential. I. TACHI (Bull. Agric. Chem. Soc. Japan, 1937, 13, 692—697, 698—704; cf. this vol., 415).—XXIV. Half wave potentials ($II_{\frac{1}{2}}$) have been determined for Ac_2 , $COPhMe$, benzoylacetone (I), benzil, benzoin, and azobenzene (II) and they show satisfactory constancy with changes in concn. ($II_{\frac{1}{2}}$) can be taken as a standard electrolytic potential. ($II_{\frac{1}{2}}$)- p_H curves for (I) and (II) are given.

XXV. ($II_{\frac{1}{2}}$) for neutral-red at a definite p_H is const. and independent of concn.; when referred to the normal H_2 electrode it agrees with the redox potential. Reduction potential- p_H curves are given. J. N. A.

Energy hump in chemistry. I. W. D. BANCROFT and J. E. MAGOFFIN (J. Franklin Inst., 1937,

224, 283—310).—In order to explain reduction-oxidation systems which do not readily fit in with the electromotive theory, the hypothesis of the energy "hump" is put forward. It is assumed that the reaction does not occur because none of the mols. attain a sufficiently high energy level under ordinary conditions. For a reaction which can be made to occur electrolytically the height of the energy hump is the difference between the free energy of the system and the voltage energy necessary for the reaction to take place. The hump is decreased with increasing concn. or temp., and may be eliminated by the use of suitable catalysts. The theory is applied to one-way electrodes, e.g., cysteine-cystine and sulphite-sulphate. Oxidation and reduction potentials are set up only if an electron transfer between the inert metal electrode and the oxidisable or reducible substance does not involve surmounting an energy hump. The catalytic decomp. of $KClO_3$ by MnO_2 is considered from this viewpoint. The theory is also applied to overvoltages, particularly in connexion with the reducing power of $CrCl_2$. A. J. M.

Decomposition potential of aluminium oxide. I. P. TVERDOVSKI and V. S. MOLTSCHANOV (J. Appl. Chem. Russ., 1937, 10, 1011—1019).—The decomp. potentials of Na_3AlF_6 (I) and of (I)- NaF , $-AlF_3$, and $-Al_2O_3$ mixtures vary linearly with temp. (965—1100°), showing that the electrolytic process is the same in all cases, and consists in decomp. of AlF_3 . With time, the $[NaF]$ of the electrolyte rises, and Al is pptd. at the cathode as the result of a substitution reaction. F liberated at the anode reacts with Al_2O_3 , and the displaced O_2 reacts with the C anode to yield CO_2 . R. T.

Overvoltage on hydrogen electrodes. K. WIRTZ (Z. physikal. Chem., 1937, B, 36, 435—443).—Measurements of the overvoltage, η , on various electrodes showed that as the activity of the electrode increases the val. of b in Tafel's equation falls, and η in some cases approaches zero asymptotically as the current strength falls. It is inferred that overvoltage cannot be wholly explained by supposing that the loss of charge represents the slowest step in the electrolytic separation of H . With an electrode at which loss of charge is probably slow there is no catalysed interchange between H and D_2O . R. C.

Polarographic studies with the dropping mercury cathode. LXX. Hydrogen overpotential in mixtures of light and heavy water and the separation coefficient. J. HEYROVSKÝ. LXXI. Changes of polarisation when using small anodes. V. MAJER (Coll. Czech. Chem. Comm., 1937, 9, 345—359, 360—376).—LXX. Theoretical. The results of Novak (this vol., 414) are discussed and a formula expressing the H overpotential in acid D_2O - H_2O mixtures is deduced. The electrolytic separation coeff. for H and D at cathodes with high overpotential is discussed.

LXXI. Apparatus for the automatic registration of current-voltage and "potential-voltage" curves (the course of the electrode potential during electrolysis with a stable Hg anode and a dropping Hg cathode) is described. In NO_3' and SO_4'' solutions considerable

changes in anode potential occur if the anode is small. In Cl^- solutions the addition of Hg_2Cl_2 stabilises the potential of large anodes, but does not prevent passivity of small anodes. In OH^- solutions red HgO does not remove changes of anodic polarisation. These phenomena are explained by supersaturation of the anodic layers and by the formation of finely dispersed HgO of increased solubility. E. S. H.

Passivity of iron and steel in nitric acid solution. XX. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 811—836; cf. this vol., 468).—The potential of an Fe anode in the active state is decreased when the ionisation of the Fe is accelerated by the passage of a current. The Fe becomes passive owing to O developed by electrolysis, and the appearance of passivity is accompanied by an increase in potential, which is not decreased by electrolysis. On applying a p.d. to the passive Fe electrode the potential of the anode is at first unaffected, but falls when the applied voltage reaches a definite val. owing to ionisation and dissolution of the Fe. A black oxide is formed. R. S. B.

A standardisation of the p_H scale. D. I. HITCHCOCK (Trans. Electrochem. Soc., 1937, **72**, Preprint 10, 157—159).—An attempt is made to rationalise the p_H scale on the basis of determinations of E_0 obtained by the use of buffer solutions each containing a weak acid of known ionisation const. and one of its completely ionised salts. J. W. C.

Penetration of electrolytic cadmium deposits into iron. G. S. VOZDVISHEVSKI and L. A. BRAMINA (J. Appl. Chem. Russ., 1937, **10**, 1173—1177).—The e.m.f. of the element Cd-plated Fe[5% NH_4NO_3] Pt rises gradually from that characteristic of Cd to that of Fe, suggesting the presence of an intermediate layer of Fe—Cd alloy. R. T.

Electrolytic preparation of ammonium persulphate. I. Potential balance data. V. V. STENDER and I. G. SHORITZKI (J. Appl. Chem. Russ., 1937, **10**, 999—1010).—The potentials at Pb cathodes (c.d. 0.02—1 amp. per sq. cm.) and Pt anodes (c.d. 0.07—8 amp. per sq. cm.), in the electrolysis of 15—35% $(\text{NH}_4)_2\text{SO}_4$ in 15—35% H_2SO_4 , at 10°, 25°, and 35°, have been determined. R. T.

Electrolytic processes in the magnetic field. C. G. FINK and M. A. COLER (Trans. Electrochem. Soc., 1937, **72**, Preprint 8, 115—145).—An investigation of certain effects arising from submitting an electrolytic cell to the influence of a direct magnetic field. Many cells, in which a steady d.c. process is normally sustained, exhibit large and reproducible changes in conductivity when subjected to certain magnetic fields. Suggested applications of the phenomenon include the use of standardised magneto-conductive cells in the calibration of strong direct magnetic fields, for controlling the intensity of such fields, and in conjunction with suitable solenoids, as const.-current devices. J. W. C.

Velocity of a coupled reaction. T. DE DONDER (Bull. Acad. roy. Belg., 1937, [v], **23**, 685—688).—Mathematical. A. J. E. W.

Rate constants of reactions of atoms and radicals as derived from different sources. J. R. BATES (Chem. Rev., 1935, **17**, 401—407).—A discussion. CH. ABS. (e)

Singular points of diagrams of isotherms of reactions. N. I. STEPANOV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 219—253).—Theoretical. R. T.

Collision, co-ordination, diffusion, and reaction velocity in condensed systems. E. RABINOVITCH (Trans. Faraday Soc., 1937, **33**, 1225—1233; cf. A., 1936, 1185).—Theoretical. J. W. S.

Propagation of explosion waves in different gases. H. MURAOUR, A. MICHEL-LEVY, and E. BURLOT (J. Phys. Radium, 1937, [vii], **8**, 330—331).—The visible trace of an explosion wave is most intense when the sp. heat of the surrounding gas is low and its mol. wt. high. F. J. L.

Optical determination of labile products in flames. V. KONDRATEEV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 363—378).—The study of combustion of gases from emission and absorption spectra data is discussed. R. T.

Reaction between nitric oxide and atomic oxygen. W. H. RODEBUSH (Chem. Rev., 1935, **17**, 409—412).—The pressure-dependence of the duration of the afterglow in the reaction of NO and O agrees with the hypothesis that this reaction occurs by triple collisions. CH. ABS. (e)

Reaction of deuterium atoms with methane at high temperatures. E. W. R. STEACIE (Canad. J. Res., 1937, **15**, B, 264—273; cf. A., 1935, 1087).—Data obtained at 250—500° for the reaction $\text{D} + \text{CH}_4 = \text{CH}_3\text{D} + \text{H}$ lead to the energy of activation 13 ± 2 kg.-cal., consistent with vals. obtained by other methods. J. G. A. G.

Flame of carbon monoxide and oxygen. II. Influence of the composition of the mixture on the intensity of the visible radiation from the flame. H. KONDRATEEVA and V. KONDRATEEV (Acta Physicochim. U.R.S.S., 1937, **6**, 625—636; cf. A., 1936, 1469).—At $p_{\text{CO}} = 40$ mm. a decrease in light yield is found with $p_{\text{O}_2} > 20$ mm., whilst with $p_{\text{O}_2} = 20$ mm. the decrease is obtained with $p_{\text{CO}} > 40$ mm. This is attributed to quenching of chemiluminescence, the quenching consts. being 0.034 and 0.162 mm^{-1} for CO and O_2 , respectively. The greater val. for O_2 is attributed to the possible process $\text{CO}_2^* + \text{O}_2 \rightarrow \text{CO}_2 + 2\text{O}$, leading to branching of reaction chains. With $p_{\text{CO}} + p_{\text{O}_2} = 57$ mm., an increase in light yield is obtained with increasing [CO], ascribable in part to quenching of chemiluminescence. In all cases deviations from the theoretical quenching curves indicate a change in reaction mechanism. Addition of N_2 at $p_{\text{CO}} = 40$ mm., $p_{\text{O}_2} = 20$ mm. causes an increase in total combustion, attaining a max. at $p_{\text{N}_2} = 100$ mm. The change in light yield indicates that the mechanism is changed and involves oxides of N. J. W. S.

Mechanism of flame movement. IV. The vibratory period. H. F. COWARD, F. J. HARTWELL, and E. H. M. GEORGESON (J.C.S., 1937, 1482—1489).—

The vibrations of the flame in air-CH₄ mixtures in tubes closed at one end correspond with the fundamental note or a low harmonic of the whole column of gas, as given by Lees' formula. The vibrations could be suppressed by partly closing the end of the tube, by providing gauze-covered slits along its walls, or by using a tube of square cross-section.

F. J. G.

Critical conditions of the reaction of oxidation of ethane. P. SADOVNIKOV (Acta Physicochim. U.R.S.S., 1937, 6, 419—440).—From experiments with C₂H₆-O₂ mixtures at 600—790° and at 30—180 mm., it is shown that there are inter-related crit. vals. of pressure, temp., and diameter of reaction vessel below which the reaction does not take place.

C. R. H.

Reaction chains in the decomposition of organic compounds. L. A. K. STAVELEY and C. N. HINSHELWOOD (J.C.S., 1937, 1568—1573).—NO inhibits chain reactions by removing free radicals. Evidence obtained in this way is summarised to indicate the relative importance of chain processes and simple rearrangements to saturated products in a no. of org. gas reactions. In some reactions the contribution of the chain process is negligible; in others free radicals are formed in only a few of the primary acts, although they may give rise to long chains. Recognition of, and allowance for, the part played by chain processes leaves the theory of the mechanism of activation essentially unchanged.

F. J. G.

Calculation of the rate of elementary association reactions. E. WIGNER (J. Chem. Physics, 1937, 5, 720—725).—Some simple reactions cannot be calc. by the present form of the transition state method, e.g., association of atoms to a mol. by three-body collision. A formula is derived for the rate of reactions of the types, $2B + A \rightarrow B_2 + A$ and $A + B + C \rightarrow AB + C$. In such reactions the exact shape of the energy surface is not so important as in reactions involving activation energies. By determining the probability of a decrease of the relative energy of two atoms below zero energy an upper limit for the rate of association reactions under the influence of a third body is found. The relation of this approx. calculation to the rigorous solution of the problem is discussed. Calc. vals. agree fairly well numerically with the experimental vals. for the recombination of I atoms (A., 1936, 1348). The calc. vals. are slightly low and reasons for this discrepancy are considered.

W. R. A.

Gaseous polymerisations. J. B. HARKNESS, G. B. KISTIAKOWSKY, and W. H. MEARS (J. Chem. Physics, 1937, 5, 682—694).—Gaseous polymerisations have been studied by following pressure changes and by analysis. Styrene is stable to about 400°, when a slow polymerisation reaction sets in, but apparently does not proceed to any marked extent since at 420° the decomp. reaction predominates. CH₂:CH·OAc does not polymerise at pressures <1 atm. Chloroprene begins to polymerise at 230° but at 260° decomp. predominates. CMe·CH does not polymerise readily and isomerisation to allene is negligible. Measureable polymerisation of allene occurs between 320° and 400° but there is no isomerisation to

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CMe·CH; the kinetics are complex. CH₂:CH·C:CH starts to polymerise at about 200° and up to 340° no decomp. is detectable; pressure changes indicate that the reaction does not stop at the dimeride stage but continues to higher polymerides. In the dimerisation of cyclopentadiene (I) the equilibrium is so far on the side of the monomeride that the reaction must be studied at pressures >1 atm., whereas the decomp. can be followed at considerably lower pressures. Drifts of the association rate consts. are presumably due to secondary reactions; since the addition of O₂ does not influence the association, a chain mechanism is apparently precluded. In addition the association of (I) in the liquid state and in tetrahydronaphthalene, and the corresponding decomp. reactions, have been investigated and are discussed. Δ^α-Pentadiene and βγ-dimethyl-Δ^α-butadiene dimerise at measurable rates and the process is not complicated appreciably by side reactions. Rate coeffs. for the diene dimerisations are given. Available data on the rates of αδ- and αβ-addition reactions of dienes are collected; they can be divided into three groups according to the magnitude of the temp.-independent factors. The mechanism of these reactions is considered from statistical and thermodynamic viewpoints, and a mechanism is postulated which involves the association of two mols. via an activated complex to a free radical, which then, by means of another active configuration, forms the ring structure characteristic of the reaction product. Thus the free radical in the case of Δ^α-butadiene has the structure $\text{C}=\text{C}-\text{C}-\text{C}-\text{C}-\text{C}=\text{C}$ which is stabilised by resonance between four possible electronic structures.

W. R. A.

Highly polymerised compounds. CLXXIII. Kinetics of chain polymerisation. III. Methods and present data. G. V. SCHULZ and E. HUSEMANN (Angew. Chem., 1937, 50, 767—773; cf. this vol., 86, 522).—The mean mol. wt. (*M*) of polymerides produced remains const. during polymerisations at const. temp. The ratio of the velocities of growth and breaking of chains can be deduced from the distribution of the product over various ranges of mol. wt. Their variation with temp. causes variation of *M* with temp. The mechanism of the activation and deactivation processes is discussed. Catalysts act principally by accelerating the primary process. In many cases they decrease *M*, this being attributed to the fact that more chains are commenced simultaneously.

J. W. S.

Kinetics and mechanism of polymerisation processes.—See A., II, 438.

Emission of ultra-violet rays during the slow decomposition of azides. R. AUDUBERT (J. Chim. phys., 1937, 34, 405—415; cf. this vol., 164, 370, 493).—Details are given of results already summarised. The temp. coeff. for the emission of radiation of λ 2150 Å., approx., during the slow thermal decomp. of azides leads to the activation energies KN₃ 20—22 PbN₃ 10—11, and NaN₃ 20—22 and 9—11 kg.-cal. with a transition temp. at approx. 365°, for the photogenic processes. These have activation energies < the slow thermal decomp. and appear to be

independent of the metal and depend only on the N_3 grouping. The thermal decomp. probably commence at the same temp. as the corresponding ultra-violet emissions in the cases of KN_3 and NaN_3 , but the min. temp. for ultra-violet emission are $>$ the initial temp. of thermal decomp. of CaN_6 and PbN_6 .

J. G. A. G.

Homogeneous first order gas reactions. VII. Decomposition of ethylidene dibutyrate and heptylidene diacetate. C. C. COFFIN, J. R. DACEY, and N. A. D. PARLEE. **VIII. Decomposition of trichloroethylidene diacetate and trichloroethylidene dibutyrate.** N. A. D. PARLEE, J. R. DACEY, and C. C. COFFIN. **IX. Decomposition of furfurylidene diacetate and crotonylidene diacetate.** J. R. DACEY and C. C. COFFIN (Canad. J. Res., 1937, 15, B, 247—253, 254—259, 260—263).—VII. The decomp. at 220—290° of 27—450 mm. of ethylidene dibutyrate (I) and heptylidene diacetate (II) vapours each into an aldehyde and an anhydride is homogeneous, unimol., and proceeds to completion. The velocity coeffs. are: (I), $k = 1.8 \times 10^{10} e^{-33,000/RT}$ and (II), $k = 3.0 \times 10^{10} e^{-33,000/RT}$. The sp. reaction velocity is independent of the size of the anhydride radical, and of the aldehyde radical when the latter has > 3 C (cf. A., 1932, 232, 702). These esters decompose at approx. the same rates in the liquid and the vapour phases.

VIII. Trichloroethylidene diacetate and dibutyrate decompose into chloral and the respective acid anhydrides at the same sp. rate in the liquid and the vapour states at 210—290°. The reactions are homogeneous and of first order. The velocity coeff. $k = 1.3 \times 10^{10} e^{-33,000/RT}$.

IX. The decomp. at 230—280° of 20—520 mm. of furfurylidene and crotonylidene diacetate vapours each into Ac_2O and the respective aldehydes is homogeneous, unimol., and proceeds to completion. The velocity coeffs. are equal; $k = 1.3 \times 10^{11} e^{-33,000/RT}$. The enhanced val. of k is attributed to the presence of the double linking.

J. G. A. G.

Rate of unimolecular and bimolecular reactions in solution as deduced from a kinetic theory of liquids. R. S. BRADLEY (Trans. Faraday Soc., 1937, 33, 1185—1197; cf., A., 1935, 173).—Mathematical. Collision frequencies and reaction rates in solution are derived from the theory of the liquid state.

J. W. S.

Period of induction in the interaction of mercuric chloride with borax. B. N. SEN (Coll. Czech. Chem. Comm., 1937, 9, 388—392).—The reaction between aq. $HgCl_2$ and $Na_2B_4O_7$ has an induction period of length inversely \propto the square of the concn. of either reagent. The reaction is homogeneous, and the induction period is lengthened by EtOH and glycerol, but shortened by $COMe_2$.

F. J. G.

Influence of solvent and temperature on speed of oxidation of organic substances by chromic acid. I. H. C. S. SNETHLAGE (Rec. trav. chim., 1937, 56, 873—884; cf. A., 1936, 1073).—Rates of oxidation of succinic, glutaric, and adipic acids by CrO_3 have been measured at 25—99° and for different concns. of H_2SO_4 . In all cases a max. rate is found

at $[H_2SO_4]$ about 75%. The relative speeds for the three acids are nearly const. for vals. of $[H_2SO_4] > 90\%$. Rise of temp. increases the abs. rates and displaces the max. towards higher $[H_2SO_4]$. F. L. U.

Rates of combustion in concentration sulphuric acid. J. MILBAUER (Coll. Czech. Chem. Comm., 1937, 9, 393—406).—The oxidation of a no. of gases and vapours, and of certain elements, by H_2SO_4 at 237° has been studied. CH_4 , C_2H_6 , and CCl_4 are not oxidised even in presence of catalysts. Under comparable conditions, the following substances are oxidised without a catalyst at rates decreasing in the order given: C_2H_2 , C_2H_4 , CS_2 , COS , H_2 , CO . Pd-black accelerates the oxidation of these, and of PH_3 , HCN , $(CN)_2$ and $MeSH$. SeO_2 and $HgSO_4$ accelerate the oxidation of S, P, C, Ag, and Sn, and $HgSO_4$ also that of Fe, whilst both substances retard the oxidation of As, Sb, and Bi, and SeO_2 retards also that of Hg, Fe, Ni, Co, and Cu. In the absence of a catalyst the metals are oxidised at rates decreasing in the order Sn, Hg, Co, Fe, Ni, Cu, Al, Ag, Zn, Cd.

F. J. G.

Equilibrium and kinetic studies on reactions of the Menschutkin type in dilute solution. I. Suggested explanation of the solvent effect. G. E. EDWARDS (Trans. Faraday Soc., 1937, 33, 1294—1306).—The reaction $MeI + NPhMe_2$, $NPhMe_2I$ has been studied in C_6H_6 , $EtOAc$, $COMe_2$, $PhNO_2$, and $MeOH$ solution, the product after various periods at known temp. being analysed by a sensitive electrometric method, which is described in detail. A mechanism is suggested which demands primary formation of unstable salt mols. in solution, these being removed from the reaction phase either by dissociation into the reactants or by crystallisation, the relative velocities of these processes therefore determining the rate of salt formation. The observed velocity coeffs. for salt formation for ten different concns. of reactants in C_6H_6 at 65° do not follow a bimol. law even in the presence of powdered glass, when the reaction proceeds more smoothly. The large variations in the val. of the equilibrium const. with change of solvent are attributed to change in the rate of the dissociation process.

J. W. S.

Kinetics of solvent decomposition of nitroamide in H_2O - D_2O mixtures. V. K. LA MER and J. GREENSPAN (Trans. Faraday Soc., 1937, 33, 1266—1272; cf. A., 1935, 1466).—The rate of decomp. (v) in 100% H_2O is 5.21 times as great as in 100% D_2O when each is 0.01N in HCl. The v -composition curve is similar to that for other prototropic reactions (A., 1925, 309; 1936, 569, 685, 1075). The data can be interpreted on the basis of an exchange between the protons of the substrate and the deuterons of the solvent. The rate-determining step is probably the removal of the proton or deuteron attached to the N atom.

J. W. S.

Functional relation between the constants of the Arrhenius equation. Solvent effects in the formation of quaternary ammonium salts. R. A. FAIRCLOUGH and C. N. HINSHELWOOD (J.C.S., 1937, 1573—1576).—The reaction studied was the formation of methylpyridinium iodide in various mixed solvents. The terms E and $\log PZ$ show a

correlation of the type previously found (this vol., 313) on which is superimposed a tendency for PZ to increase with the polarity of the solvent.

F. J. G.

Hydrolysis of acid chlorides. IV. Acetyl, propionyl, and butyryl chlorides. J. RODRIGUEZ VELASCO and A. OLLERO (Anal. Fis. Quim., 1937, 35, 76—83; cf. this vol., 367).—The velocities of hydrolysis have been determined in PhMe at 25° and 45° and these, together with the vals. for $o\text{-C}_6\text{H}_4\text{Me}\cdot\text{COCl}$ and $\text{CH}_2\text{Ph}\cdot\text{COCl}$, obey the relation $\log k_2/\log k_1 = 0.30(n_2 - n_1)$ ($n = \text{no. of C atoms}$). The energies of activation of the three chlorides all lie between 5000 and 6000 g.-cal. (see this vol., 142) and by varying the p_{H} it is shown that the H^+ do not catalyse the reactions (*loc. cit.*).

F. R. G.

Influence of the activity of hydrogen ions on the velocity of hydrogenation of ketones in a liquid medium in presence of platinised Raney nickel or of platinum-black poisoned with thiophen. B. FORESTI and (SIGNA.) C. CHUMMO (Gazzetta, 1937, 67, 408—416).—The discrepancy between the accelerating influence of Na_2CO_3 on the speed of hydrogenation (v) of org. substances in presence of platinised Ni, observed by Delepine and Horeau (A., 1936, 686), and the retarding influence of alkalis observed by the authors (Boll. Soc. Eustachiana, 1936, 34, 15, 69, 73) is primarily due to difference of solvent and of catalyst. Two factors determine change of v : activation of the catalyst, and activation of the org. substance; these may vary differently with p_{H} . Using Ni + Pt, v for COMePh and COPh_2 in 90% EtOH, and for COMePh in $\text{n-K}_2\text{SO}_4$, increases with p_{H} (as altered by AcOH and NaOH), and that for cyclohexene in EtOH or K_2SO_4 decreases; C_6H_6 is not hydrogenated. Using PtO_2 , v for COMePh or COPh_2 in EtOH decreases with p_{H} . The progressive poisoning of PtO_2 by thiophen is studied; for COMePh and a catalyst so poisoned, v is min. at neutrality.

E. W. W.

Influence of the walls of the vessel on the course of alcoholic reactions.—See A., II, 445.

Kinetics of biochemical reactions.—See A., III, 427.

Thermodynamics and the velocity of irreversible processes. II. Chemical reaction velocity. III. Changes of structure in solids. A. R. UBBELOHDE (Trans. Faraday Soc., 1937, 33, 1198—1202, 1203—1212; cf. this vol., 362).—II. When the fluctuations giving rise to irreversible chemical change can be treated as independent, the velocity coeff. can be expressed in terms of the equilibrium const. for their concn., which changes regularly with the thermodynamic variables of the system. When they are not independent, wall effects and anomalous dependence on pressure are observed, as, e.g., for chain reactions. Thermodynamic probabilities can be used to express the velocity of irreversible change only when they \propto kinetic probabilities and are not dependent on co-operative fluctuations.

III. Solid-liquid transitions, supercooling, superheating, and the law of successive states are explained in terms of an expression for the probability of finding the requisite fluctuations in the system. Hysteresis

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in various changes and superconductivity are also discussed.

J. W. S.

Size of bubbles of hydrogen from aluminium in hydrochloric acid. E. JENCKEL and H. HAMMES (Z. anorg. Chem., 1937, 233, 415—423).—When H_2 is being rapidly evolved the mean diameter of the bubbles is large, and the individual sizes vary widely. As the rate of evolution diminishes the bubbles become smaller and more nearly equal in size. These relationships are found when the rate of evolution is controlled either by the action of "poisons" or by the concn. of the acid, and also in electrolysis. The "poisons" have thus no sp. effect on the size of the bubbles.

F. J. G.

Initial corrosion rate of mild steel.—See B., 1937, 1059.

Velocity of oxidation of cobalt. (MME.) G. CHAUVENET and G. VALENSI (Compt. rend., 1937, 205, 317—319).—Between 850° and 1100° the rate of oxidation of ordinary Co is given by $v = 8.51se^{-9520/T}\sqrt{t}$ ($v = \text{g. of O}_2 \text{ absorbed, } s = \text{surface}$). Pure Co oxidises more rapidly.

F. J. G.

Radiations accompanying corrosion of metals. I. A. A. ULJANOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 205—210).—The corrosion of Al, Mg, Pb, Cd, and Zn is accompanied by emission of radiation of $\lambda < 3530 \text{ \AA}$. The λ of the radiation depends on the metal and conditions of corrosion. The intensity of radiation \propto rate of corrosion and can be used to determine the protective properties of oxide films. The order of increasing intensities is Pb, Al, Zn, Cd, Mg, indicating that the film on Pb is more continuous and has greater protective power than that on Mg. Uses of the phenomenon in industry are indicated.

A. J. M.

Influence of traces of oxygen on the kinetics of the thermal decomposition of gaseous acetaldehyde. M. LETORT (J. Chim. phys., 1937, 34, 428—443; cf. this vol., 416).—The initial rate, v_0 , of thermal decomp. of 75—235 mm. of MeCHO at 450—512° is greatly accelerated by 0.0001—0.025 vol.-% of O_2 , and the order of the reaction with reference to time is increased. $v_0 - k_0[\text{MeCHO}]^{3/2} + k_0'[\text{MeCHO}]^{3/2}[\text{O}_2]$; at 477°, $k_0 = 8.18 \times 10^{-4}$ and $k_0' = 0.383$ (units: min., mm.). k_0' decreases with rise of temp. When a fraction of MeCHO, \propto the O_2 added, has decomposed, the rate of decomp. falls to that observed with pure MeCHO. The no. of mols. of MeCHO decomposed by the action of each O_2 mol. present rises from about 1000 with 0.015 vol.-% of O_2 to approx. 4500 as $[\text{O}_2]$ approaches zero. The catalysed reaction is interpreted as a chain reaction initiated by O_2 , and is shown to have had negligible effect on the results for pure MeCHO previously published (*loc. cit.*).

J. G. A. G.

(A) Mechanism of the catalytic oxidation of sulphur dioxide in a solution of manganese salts. (B) Action of ozone on solutions of manganous salts. M. K. GRODZOVSKI (J. Phys. Chem. Russ., 1935, 6, 478—495, 496—510).—(A) Catalytic oxidation of SO_2 in presence of Mn^{++} ions occurs through the formation of a complex of the type $\text{Mn}^{++}, x\text{SO}_2$.

which on oxidation gives SO_3 and Mn^{+++} , the latter being then reduced by SO_2 .

(B) O_3 accelerates oxidation of the $\text{Mn}^{++}, x\text{SO}_2$ complex and also oxidises Mn^{++} directly. It destroys negative catalysts such as PhOH , which are capable of poisoning the Mn catalyst. O_3 does not oxidise H_2SO_4 directly in 0.7–0.9% H_2SO_4 . CH. ABS. (e)

Stabilisation of concentrated solutions of hydrogen peroxide.—See B., 1937, 1045.

Kinetics of catalysed polymerisation of styrene. G. WILLIAMS (Nature, 1937, 140, 363–364).—The kinetics of the polymerisation of styrene (I), catalysed by anhyd. SnCl_4 , in CCl_4 or CHCl_3 at 25° , can be followed by determining the amount of residual monomeric (I) by quant. Br addition to the double linking, using an excess of Br. With specially-purified materials polymerisation is rapid, but with traces of impurities, *e.g.*, those present in commercial SnCl_4 , temporary total inhibition may occur. H_2O produces retardation, and dry HCl is a total temporary inhibitor, probably by addition to the (I) double linking. The polymerides formed have a mol. wt. of the order of 3000. L. S. T.

Theory of heterogeneous catalysis. L. V. PISARSHEVSKI (Acta Physicochim. U.R.S.S., 1937, 6, 555–574; cf. A., 1933, 1018).—The catalytic activity of metals is attributed to pairing of free electrons emitted at the surface with the electrons in adsorbed material, forming an ion which is in condition to react. J. W. S.

Relationship between the magnetic moment of a metal atom and its catalytic activity. T. KITAGAWA (Rev. Phys. Chem. Japan, 1937, 11, 71–75).—A discussion. Atoms of metals used as catalysts usually have a large magnetic moment. Those which do not, usually have such a moment in the multiplet levels for the lowest electronic states. Localised non-homogeneous magnetic fields due to such atoms in the catalyst surface may constitute one of the causes of catalytic activity. H. J. E.

Oxidation and inflammation in contact with hot surfaces. II. Heterogeneous combustion and adsorption of explosive gases on glass surfaces or glass surfaces coated with potassium chloride. Influence of adsorption on the chain reaction of oxygen-hydrogen mixtures. III. Mechanism of the chain reaction of oxygen-hydrogen mixtures and effect of potassium chloride in this combustion. M. PRETTRE (Mem. Poudres, 1937, 27, 253–273, 274–296).—II. With explosive O_2 - H_2 mixtures at 500 – 600° the walls, whether lined with an alkali-metal salt or not, exert a catalytic effect. The surface reaction in every case, except at very low pressures, obeys the unimol. law, $v = k[\text{H}]^2$, and is independent of O_2 pressure; the temp. coeff. is low. A large glass surface is required to obtain a measureable velocity of the heterogeneous reaction, so that the effect of this is practically negligible with the vessels used for studying the homogeneous transformation of the same combustible mixtures. The retardation of the homogeneous reaction caused by the salt lining cannot be attributed to special catalytic activity of the salt, nor is the

greater velocity of the homogeneous transformation caused by the surface. The surface reaction is therefore almost completely independent of the reactions that set up and propagate the chains of homogeneous combustion and inflammation. Either lined or unlined glass surfaces adsorb in the active state appreciable amounts of H_2 and H_2O vapour at 500 – 600° . The alkali salt lining considerably reduces the velocity of adsorption. Homogeneous transformation into chains of the explosive gas is accelerated or retarded by these adsorptions according as H_2 or H_2O vapour is concerned. The alkaline film considerably reduces the importance of the condensations, but allows reproducible results to be obtained in the study of chain reactions, which is one of the reasons for the lower velocity of the homogeneous reaction in presence of lined surfaces.

III. The mechanism of the action of KCl on the homogeneous reactions of oxidation and ignition of H_2 is discussed. In a vessel coated with KCl the rate of oxidation at $p > 350$ mm. and at 535 – 560° is given by: $v = K[\text{H}_2]^2[\text{O}_2]e^{-95,000/RT}$. W. J. W.

Influence of solvent on heterogeneous catalysis. Catalysis of hydrogen peroxide [decomposition] in different solvents. I. L. V. PISARSHEVSKI and T. S. GLUCKMANN (Acta Physicochim. U.R.S.S., 1937, 6, 575–586; cf. A., 1935, 455).—The catalytic decomp. of H_2O_2 by Pt has been studied in H_2O , Et_2O , and H_2O - Et_2O mixtures, and it is concluded that the reaction would not proceed at all in perfectly dry Et_2O . The effect of solvent is attributed to an interaction of forces between the catalyst and its surroundings, which influences the velocity of a catalysed reaction. J. W. S.

Mechanism of the catalysis of the oxidation of carbon monoxide on a hopcalite surface. I. Poisoning of the hopcalite by water vapour. N. SCHURMOVSKAJA and B. BRUNS (Acta Physicochim. U.R.S.S., 1937, 6, 513–530).—The oxidation of CO on a hopcalite surface is of zero order with respect to CO and shows an initial period with increased activity, presumably through oxidation at the expense of the MnO_2 and causing irreversible change in the latter, followed by normal oxidation by mol. O_2 . The heat of activation varies according to the sample from 5000 to 7000 kg.-cal. per mol. The activity decreases linearly with increasing concn. of adsorbed H_2O on the catalyst surface and disappears completely in presence of 2.7% of H_2O . There are two types of active spots on the hopcalite surface, with heats of wetting of 7200 and 500 g.-cal. per mol. of H_2O , respectively. J. W. S.

Catalytic de-oxygenation of nitrogen-hydrogen mixtures.—See B., 1937, 1045.

Activity of the Casale catalyst at atmospheric pressure.—See B., 1937, 1042.

Decomposition of nitrous oxide on a silver catalyst. E. W. R. STEACIE and H. O. FOLKINS (Canad. J. Res., 1937, 15, B, 237–246).—The rate of decomp. of 5–40 cm. of N_2O on a reduced Ag_2O catalyst at 450° is given by $-d[\text{N}_2\text{O}]/dt = k[\text{N}_2\text{O}]/(1 + b[\text{O}_2])$. N_2O is therefore only slightly adsorbed, but O_2 is fairly strongly adsorbed and retards the

reaction. Added O_2 affects the reaction as predicted by the above equation (cf. A., 1936, 807).

J. G. A. G.

Mechanism of activation process of carbon. S. S. BHATNAGAR, P. L. KAPUR, and R. K. LUTHRA (Kolloid-Z., 1937, 80, 265—268).—In specimens of sugar C activated by H_2O vapour, $ZnCl_2$, Na_2O_2 , or $Al_2(SO_4)_3$, increasing activation corresponds with increasing adsorption of $KMnO_4$ or $BzOH$ and with decreasing magnetic susceptibility. These changes are traced to the formation of graphite crystallites in the surface and their preferential oxidation to pyrographitic acid.

E. S. H.

Decomposition of methane on the surface of platinum. I, II. M. KUBOKAWA (Rev. Phys. Chem. Japan, 1937, 11, 82—95, 96—106).—I. The decomp. of CH_4 in contact with an electrically heated Pt wire at 900—1300° and at pressures of 1—20 mm. is entirely heterogeneous. The activity falls progressively owing to formation of C. Other products were C_2H_4 , C_2H_6 , and H_2 . The reaction velocity is given by $dx/dt = k(a - x)/x^n$. The index n is >1 and depends on the heterogeneity of the surface. The retarding effect of H_2 was very slight. The apparent heat of activation was 31 kg.-cal.

II. The above equation is applicable to data for the decomp. of CO on Ni at 240—300°/15—70 cm. and for the decomp. of NH_3 on Pt at 1212°/350 mm. and 865°/200 mm. Changes in the val. of the coeff. n with temp. and pressure, and with the presence of poisons, are discussed.

H. J. E.

Catalytic synthesis of hydrocarbons.—See B., 1937, 1005.

Influence of the solid phase on the thermal ignition of the mixture $CH_4 + 2O_2$. M. V. POLJAKOV and K. K. GRIANENKO (Acta Physicochim. U.R.S.S., 1937, 6, 587—608; cf. this vol., 36).—The induction period in the ignition of $CH_4 + 2O_2$ mixtures in presence of a fixed amount of Pt wire catalyst accords with the formula of Neumann and Egorov (A., 1933, 129). The results are interpreted on the basis of heterogeneous-homogeneous catalysis, in which the surface emits active centres into the vol. (A., 1935, 588).

J. W. S.

Catalyst poisoning from the viewpoint of the specificity of active centres. V. Relative duration of stay of water and ethyl alcohol molecules on copper. A. BORK and M. I. DARIKINA (Acta Physicochim. U.R.S.S., 1937, 6, 375—392).—Measurements have been made at 257.5° with an activated Cu surface. The dehydrogenation of EtOH in presence of H_2O has been followed and compared with the AcOH formed as a result of the reactions $MeCHO + H_2O \rightleftharpoons CHMe(OH)_2 \rightleftharpoons AcOH + H_2$. The amounts of AcOH formed increase with increase in the ratio $H_2O : EtOH$. This removal of MeCHO as AcOH from the active centres allows fresh EtOH mols. to be dehydrogenated; in this way the protective effect of H_2O on the catalyst is explained.

C. R. H.

Role of carriers in catalysis. I. E. ADADUROV (J. Phys. Chem. Russ., 1935, 6, 206—220; cf. A., 1935, 1086).—The decomp. of EtOH on various

Cu-on-charcoal catalysts was studied. The catalytic effect increases with the proportion of Cu to C. Heats of activation for various Cu : surface C ratios are calc.

CH. ABS. (e)

Heterogeneous catalytic racemisation of *l*-isobutyl alcohol. R. L. BURWELL, jun. (J. Amer. Chem. Soc., 1937, 59, 1609—1612).—When *l*-Bu²OH is passed over Pyrex glass at 612°, $[\alpha]_D$ is not altered when 25% decomp. has occurred; when passed over Zn chromite, Cu, Cr_2O_3 gel, or ignited Cr_2O_3 , $[\alpha]_D$ is lowered. The racemisation probably results from dissociative adsorption of *l*-Bu²OH.

E. S. H.

Paramagnetic isomerisation of maleic acid into fumaric acid in aqueous solution. B. TAMAMUSHI and H. AKIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 382—389).—In extension of earlier work (this vol., 251) it is shown that the isomerisation is catalysed by O_2 , Pt-black, and Pd-black. The catalytic effect of a no. of paramagnetic ions shows a parallelism between the fumaric acid produced and the magnetic moment of the catalyst.

F. R. G.

Thermal decomposition of cresol on a glowing wire.—See A., II, 454.

Catalytic polymerisation of ethylene at atmospheric pressure.—See A., II, 438.

Bromination of bromo-, chloro-, and fluoro-benzenes in the gas phase. Effect of temperature and catalyst on the substitution type.—See A., II, 450.

Catalytic desulphurisation [with nickel] of petroleum products.—See B., 1937, 1004.

Effect of platinising on the electrochemical oxidation of Ceylon graphite in sulphuric acid solution. V. SIHVONEN and E. LINDROOS (Suomen Kem., 1937, 10, B, 15—18; cf. this vol., 38).—The strong absorption of H_2 at a graphite cathode in alkaline solution, and of O_2 at an anode in acid, is confirmed. Slight platinising of the anode leads to a higher ratio of $CO_2 : CO$ in the gas evolved in the electrolysis of dil. H_2SO_4 in consequence of the enhanced formation of $\cdot CO \cdot$ groups at the graphite surface, but does not promote evolution of O_2 . If, however, enough Pt is deposited to form a single conducting layer, O_2 is freely evolved.

F. L. U.

Electrodeposition of chromium from potassium dichromate baths.—See B., 1937, 1069.

Electrolytic reduction of *n*-valeraldehyde to *n*-pentane.—See A., II, 443.

Theory of gas reactions in high-frequency electric discharges. A. S. PREDVODITELEV (J. Phys. Chem. Russ., 1935, 6, 417—427).—Theoretical expressions, deduced for the rates of reactions in a gaseous medium containing ions, are in satisfactory agreement with data for the formation of O_3 and for the oxidation of SO_2 .

CH. ABS. (e)

Kinetics of the decomposition of hydrogen sulphide in a high-frequency discharge. L. KOLODKINA (J. Phys. Chem. Russ., 1935, 6, 428—435).—The decomp. of H_2S at -15° to 18° follows a unimol. law. Polysulphides are formed, the decomp. of which on the walls into H and various S polymerides is the rate-determining reaction.

CH. ABS. (e)

Possibility of the influence of long waves of a high-frequency discharge on gaseous chemical reactions. N. ZALOGIN and N. NETSCHAEVA (J. Phys. Chem. Russ., 1935, 6, 436—444).—The excitation of O_3 and SO_2 in a high-frequency discharge, and the formation of N oxides, were studied. A dependence of the amount of reaction on the λ was observed. CH. ABS. (c)

Chemical reactions in electric discharges. III. Heterogeneous recombination of atoms. S. ROGINSKI and A. SCHECHTER (Acta Physicochim. U.R.S.S., 1937, 6, 401—418; cf. A., 1935, 1087).—The recombination coeffs. of H and N atoms at a Pt surface have been determined at high temp. Similar experiments with a W surface gave no evidence of recombination. The recombination of O atoms on the surface of easily and difficultly oxidisable metals is also described. Admixture of A with N or O atoms has a stabilising influence on their recombination. The data are discussed. C. R. H.

Chemistry of some photo reactions in non-ideal solutions. G. K. ROLLEFSON (Chem. Rev., 1935, 17, 425—432).—A discussion. CH. ABS. (c)

Correlation of photochemical reactions in gases with those in solution. R. G. DICKINSON (Chem. Rev., 1935, 17, 413—424).—Data are compared. CH. ABS. (c)

Photographic action of sputtered platinum films. S. ONO (Rev. Phys. Chem. Japan, 1937, 11, 76—81).—Films of Pt sputtered in O_2 and placed in close proximity to a photographic film in an atm. of $H_2 + O_2$ caused latent image formation in the film. The effect is different from that of a polished Pt plate and is attributed to the action of H_2O_2 vapour on the film. H. J. E.

Optical investigations of the latent image and the print-out effect of photographic emulsions. A. VAN KREVELD and H. J. JURRIENS (Physica, 1937, 4, 746; cf. this vol., 317).—A correction. H. J. E.

Photographic studies. IV. C. WINTHER (Z. wiss. Phot., 1937, 36, 209—216; cf. A., 1933, 359).—A brief survey is given of primary photochemical action with subsequent secondary reactions in the dark [e.g., H_2O_2 decomp. in presence of $K_3Fe(CN)_6$], and also of the various types of luminescence (with examples). J. L.

Grain size and light-sensitivity of silver bromide.—See B., 1937, 1136.

Chemistry of inorganic [photographic] developers.—See B., 1937, 1137.

Absorption spectrum and photochemical sensitising action of uranyl sulphate in aqueous solution. P. PRINGSHEIM (Physica, 1937, 4, 733—745).—The photolysis of $H_2C_2O_4$ sensitised by UO_2SO_4 cannot be explained by collisions of the second kind because the effect of I^- ions in inhibiting the photolysis is much too small compared with their effect on the fluorescence. Data for the absorption spectrum of aq. UO_2SO_4 and for the effect of $H_2C_2O_4$ in increasing the absorption coeff. for λ 3650 Å. are given. The photolysis is best explained in terms of complex formation. H. J. E.

Mercury-sensitised reactions of methane, deuteromethanes, and the hydrogen isotopes. K. MORIKAWA (J. Chem. Physics, 1937, 5, 751).—Errata (cf. this vol., 317). W. R. A.

Polymerisation of ethylene and acetylene photosensitised by acetone. H. S. TAYLOR and J. C. JUNGERS (Trans. Faraday Soc., 1937, 33, 1353—1360).—Polymerisation of C_2H_4 and C_2H_2 can be induced at room temp. and higher temp. by photodecomp. of admixed $COMe_2$; it is attributed to the action of radicals produced from the $COMe_2$. The yield increases with rising temp., decreasing $[COMe_2]$, and decreasing light intensity. At low $[C_2H_4]$ the polymerisation \propto the $[C_2H_4]$ but becomes independent of it above 30 cm. It is suggested that free radicals also play a role in other methods of obtaining polymerisation. J. W. S.

Newer problems in inorganic chemistry. W. KLEMM (Angew. Chem., 1937, 40, 524—535).—A lecture. The structure of inorg. compounds is discussed, and distinction drawn between compounds with ionic linking, at. linking, metallic linking, and compounds of transition elements. The properties of each class of compound are discussed. J. W. S.

Reactions in liquid ammonia and liquid sulphur dioxide. H. J. EMELÉUS (Chem. and Ind., 1937, 813—815).—A review. H. J. E.

Quantitative separation of neon and helium. K. PETERS (Z. physikal. Chem., 1937, 180, 44—50).—Below -225° Ne is quantitatively adsorbed by activated C and pure He can be quantitatively pumped off. Demonstration as a lecture experiment is described. R. C.

Exchange of hydrogen with deuterium in solution. A. E. BRODSKI (Trans. Faraday Soc., 1937, 33, 1180—1185; cf. A., 1936, 160).—In all ten cases so far investigated except that of $COMe_2$ the coeff. of exchange (α) between H and D is approx. 1. Assuming random distribution of H and D atoms between various isotopic mols. in solution a relationship is deduced between α and the equilibrium const. of the exchange reaction. The high val. of α for $COMe_2$ (1.21) is attributed to tautomeric transformation. J. W. S.

Quantitative separation of isotopes of hydrogen by fractional desorption. K. PETERS and W. LOHMAR (Z. physikal. Chem., 1937, 180, 51—57).—Preliminary experiments on the separation of H_2 and D_2 have indicated that fractional desorption in vac. is the most efficient method. R. C.

Separation of isotopes by diffusion. R. SHERR and W. BLEAKNEY (Physical Rev., 1936, [ii], 49, 882—883).—Results of a test investigation of a set of Hertz diffusion pumps on a 1 : 1 mixture of H_2 and D_2 are recorded. 99% D_2 was obtained in one operation. Separation factors for 1 : 1 $H_2 + D_2$, tank H_2 , Ne, and O_2 are given. L. S. T.

Exchange reactions of hydrogen with deuterium. III. Exchange in amino-groups. M. M. SLUCKAJA, J. M. SCHERSCHEVER, and A. E. BRODSKI (Acta Physicochim. U.R.S.S., 1937, 6, 441—446).—

D-H exchange between D_2O and $N_2H_4 \cdot H_2SO_4$, $CO(NH_2)_2$, NH_2Ac , $NH_2 \cdot CH_2 \cdot CO_2H$, and $o-NH_2 \cdot C_6H_4 \cdot CO_2H$ has been studied. The exchange coeff. depends on concn., and the equilibrium const. of the exchange reaction in aq. solution is approx. 1.23.

C. R. H.

Amorphous and crystallised oxide hydrates and oxides. XXXVI. Is lithium hydroxide amphoteric? Heteropoly-bases. A. KRAUSE and S. KRZYŻANSKI (Ber., 1937, 70, [B], 1975—1979).—The solubility of $LiOH$ in $>12.7N$ - $NaOH$ at 20° increases. $LiOH$ thus resembles $Ba(OH)_2$ and is not necessarily amphoteric (cf. Scholder and Patsch, A., 1935, 577; Krause, *ibid.*, 1075). The phenomenon is most readily explained by the assumption of the formation of heteropoly-bases, $LiOH \cdots NaOH \cdots NaOH$. The solid phase is $LiOH \cdot H_2O$ or at $>15.7N$ - $NaOH$ is $LiOH$. $LiOH$ and $NaOH$ do not tend to give mixed crystals. The relationships between hydroxo compounds, heteropoly-bases, and true salts are described.

H. W.

Composition of some complex metallic cyanides. I. Potassium silver cyanide. R. L. DORRANCE, R. C. ELLIS, and A. D. MATHESON (Trans. Electrochem. Soc., 1937, 72, Preprint 7, 109—114).—Conductometric and potentiometric titrations of solutions containing $KCN + AgNO_3$ indicate the formula $KAg(CN)_2$ for the complex cyanide. Free cyanide cannot be titrated by $AgNO_3$ using a Ag electrode.

J. W. C.

Dehydration of copper potassium sulphate. (MME.) N. DEMASSEUX and B. FEDEROFF (Compt. rend., 1937, 205, 457—459).—Debye-Scherrer X-ray diffraction diagrams, obtained at different stages in the dehydration by heating of $K_2Cu(SO_4)_2 \cdot 6H_2O$ and of $CuSO_4 \cdot 5H_2O$ are given. The former gives the dihydrate at $>68^\circ$ and the anhyd. salt at 140 — 160° ; this occurs in another form at $>200^\circ$. $CuSO_4 \cdot 5H_2O$ gives the trihydrate at $>60^\circ$, the monohydrate at 140° , and the anhyd. salt at 240° .

A. J. E. W.

Treatment of silver sulphide precipitates. Extraction of pure silver. C. C. DOWNIE (Chem. & Ind., 1937, 884—885).—Current practice is described.

E. S. H.

Calcium silicates. II. Microstructure. S. KONDO and T. YAMAUCHI (J. Japan Ceram. Assoc., 1934, 42, 304—313; cf. A., 1933, 916).— $CaO \cdot SiO_2$ prepared at 1500° was the almost pure α -form. The β \rightarrow γ inversion of $2CaO \cdot SiO_2$ prepared at 1700° takes place more suddenly than the $\alpha \rightarrow \beta$ change.

CH. ABS. (e)

Precipitation of tricalcium phosphate and hydroxyapatite. G. FOURETIER (Compt. rend., 1937, 205, 413—415).—Interaction of H_3PO_4 and aq. $Ca(OH)_2$ gives a mixture of $Ca_2(HPO_4)_2$ with colloidal $Ca_3(PO_4)_2$; in contact with the mother-liquor the latter is slowly hydrolysed to $10CaO \cdot 3P_2O_5 \cdot aq$.

A. J. E. W.

Action of methane on strontium and barium chlorides.—See B., 1937, 1044.

Isomeric compounds of boron, hydrogen and oxygen. R. C. RAY (Trans. Faraday Soc., 1937, 33, 1260—1266; cf. J.C.S., 1922, 1221, 1088).—When fused

B_2O_3 (x g.) is heated strongly in an Fe tube in a current of H_2 with dried Mg powder ($2.2x$ g.) until the mixture deflagrates, and 2% of Mg powder and 15% of H_3BO_3 are added to the powdered product before extraction with $0.01N$ - KOH at 0° , the sol. extract contains the compounds β - $B_2H_4K_2O_2$ (I) and β - $B_2H_2K_2O_2$, which are separable by fractional crystallisation. If extraction is carried out with H_2O at 0° , and $0.05N$ aq. KOH is added to the filtered solution, $Mg(BO_2)_2$ and $Mg(OH)_2$ are pptd. and the solution on fractional crystallisation yields the compound β - $B_2H_2K_4O_6$ (II). (I) is converted into (II) by the addition of theoretical quantity of aq. KOH and evaporating in a vac. All the compounds are strong reducing agents and are completely oxidised by HNO_3 . All excepting (I) are fairly stable in a vac. or in the absence of H_2O and CO_2 . The equiv. conductivities of solutions of the compounds have been determined at 25° . The structures of these compounds and of their α -isomerides are discussed.

J. W. S.

Reactions of solutions of aluminates with sodium silicate. V. D. DJATSCHKOV (J. Appl. Chem. Russ., 1937, 10, 1211—1215).—Na aluminate (I) solutions are stabilised or coagulated by aq. Na silicate (with const. $Al_2O_3 : SiO_2$), according to the concn. of (I). It is inferred that (I) is in colloidal solution.

R. T.

X-Ray studies on the hydrous oxides. VIII. Gallium, indium, and thallic oxides. W. O. MILLIGAN and H. B. WEISER (J. Amer. Chem. Soc., 1937, 59, 1670—1674).—The compositions of the oxides pptd. under different conditions have been established.

E. S. H.

Pentacarbon dioxide. $O:C:C:C:C:O$. A. KLEMENC and G. WAGNER (Ber., 1937, 70, [B], 1880—1882; cf. A., 1934, 969, 1314).—In the homogeneous gas phase C_3O_2 simultaneously undergoes polymerisation and the change, $C_3O_2 \rightleftharpoons CO_2 + C_2$. The reactions occur at widely differing rates and the controlling conditions have not been established definitely. C_3O_2 from $CH_2(CO_2H)_2$ is almost completely polymerised at 200° but gives a small amount of pentacarbon dioxide, C_5O_2 , b.p. $105^\circ (\pm 3^\circ)$; this is very stable and shows no tendency towards polymerisation. It is slowly transformed by H_2O at room temp. into CO_2 and a tricarboxylic acid, $C_{18}H_{16}O_{12}$ (sparingly sol. Ba salt). Formation of C_5O_2 may occur $C_3O_2 + C_2 = C_5O_2$, but it is remarkable that its production has not been detected in C_3O_2 arising from diacetyltartaric anhydride.

H. W.

Action of ozone on active charcoal. B. BRUNS, E. KOZLOVA, and M. MAKSIMOVA (J. Phys. Chem. Russ., 1935, 6, 977—984).—Active C reacts with up to 63% of its wt. of O_3 at -30° to 20° , forming an acid substance which reacts with 1 equiv. of $NaOH$ per mol. of O_3 absorbed. The reaction is approx. unimol. (0 — 20°), the activation energy being 4400 g.-cal. The acids formed decompose at $>20^\circ$ into CO and CO_2 . Explosion may result on heating rapidly to a higher temp. O_3 -treated C adsorbs C_6H_{12} only weakly. The C recovers its adsorptive capacity partly by heating to 400° or 900° . The area occupied by the acids formed by O_3 is approx.

1700 sq. m. per g. O_3 treatment closes some of the pores formed during activation. CH. ABS. (e)

Prevention of extraction of silicic acid by natural waters stored in glass vessels. B. A. SKOPINTZEV and E. I. PLETNIKOVA (J. Appl. Chem. Russ., 1937, 10, 1310—1313).—The $[SiO_2]$ of sea- or fresh H_2O rises after 1—10 days of storage in glass (giving a positive iodococin reaction), by 0.15—1.6 mg. per litre. Extraction of SiO_2 is prevented by adding 4 drops of 50% H_2SO_4 per 100 ml. of H_2O .

R. T.

Corrosion of tin in nearly neutral solutions. T. P. HOAR (Trans. Faraday Soc., 1937, 33, 1152—1167).—The corrosion of Sn by aq. Na and K salts has been studied by observation of the change of electrode potential (V). The pre-immersion oxide film behaves as a cathode towards unoxidised spots in its pores, and consequently repair of this film first occurs owing to anodic oxide formation on these spots, and V increases. As the pore closes, however, the anodic c.d. rises, and the $[OH^-]$ in its vicinity decreases, until finally the anolyte becomes so acid that the metal tends to be converted into sol. Sn^{++} rather than into oxide, leading to undermining and breakdown of the film. Anodic oxide formation can then recommence and finally forms a black spot at the point of breakdown. Such spots are observed in solutions of salts the anions of which give no ppt. with Sn^{++} (Cl^- , Br^- , ClO_4^- , SO_4^{--} , and NO_3^-) but not in presence of those giving stable ppts. with Sn^{++} (IO_3^- , BO_3^{--} , HPO_4^{--} , CrO_4^{--} , CNS^- , I^- , NO_2^- , HCO_3^- , MnO_4^- , $Fe(CN)_6^{--}$, $Fe(CN)_6^{--}$, and SO_3^{--}). Chlorides cause most attack and conc. solutions cause more rapid breakdown than dil. solutions. NH_4Cl , $MgCl_2$, $CaCl_2$, and $ZnCl_2$ behave like $NaCl$ and KCl , but black spots once formed grow faster in these solutions. The rate of oxidation of freshly abraded Sn is very rapid during the first few min., but becomes relatively slow after about 6 hr.

J. W. S.

Reducing reactions of stannite. H. SATO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 804—810).—Alkaline solutions of stannite reduce NO_3^- , NO_2^- , and NH_2OH to NH_3 .

R. S. B.

Preparation of phosphorus peroxide. P. W. SCHENK and H. REHAAG (Z. anorg. Chem., 1937, 233, 403—410; cf. A., 1936, 1475).—The most favourable conditions for the prep. of the violet substance (apparently P_2O_6) are described. It is also formed when P_2O_5 alone is sublimed through the discharge tube, P being liberated at the same time. The substance decomposes at 130° in vac. It is insol. in $CHCl_3$, and this can be used to concentrate it by dissolving P_2O_5 . Its solution in H_2O has the reactions of peroxyphosphoric acid, $H_4P_2O_8$.

F. J. G.

Phosphine and arsine derivatives of the group I(b) metals—See A., II, 449.

Bismuth sulphates. S. ŠKRAMOVSKY and O. VONDRÁŠEK (Coll. Czech. Chem. Comm., 1937, 9, 329—344).—The prep. of the compounds $Bi(OH)SO_4 \cdot 4H_2O$, $Bi(OH)SO_4$, $Bi_2(SO_4)_3 \cdot 7H_2O$, and $Bi_3H(SO_4)_5 \cdot 6H_2O$ is described and the existence of

$Bi(OH)SO_4 \cdot H_2O$, $Bi_2(SO_4)_3 \cdot 3H_2O$, $BiH(SO_4)_2 \cdot H_2O$, and $BiH(SO_4)_2 \cdot 3H_2O$ confirmed. E. S. H.

Sulphur monoxide. VII. Improved method for the preparation, and some properties, of pure sulphur monoxide. P. W. SCHENK (Z. anorg. Chem., 1937, 233, 385—400).—An improved apparatus, permitting the prep. of SO from a known amount of SO_2 , is described. The formula SO has been confirmed by quant. synthesis ($S + SO_2$). On decomp., not all of the SO is given up, so that the "S" remaining contains O corresponding approx. with S_2O . At 100° in vac. this residue gives up its O as SO_2 containing a large proportion of SO and can thus be used as a convenient source of the latter. SO reacts with Cl_2 and Br forming $SOCl_2$ and $SOBr_2$. The limit of the spectroscopic detection of SO is 10^{-3} mm. partial pressure.

F. J. G.

Complexity of the solid state of sulphur trioxide and other substances. H. GERDING and R. GERDING-KROON (Rec. trav. chim., 1937, 56, 794—802; cf. this vol., 218, 291).—A discussion.

F. L. U.

Hyposulphite. V. Reduction by zinc amalgam of sodium sulphite and zinc sulphite under the action of carbon dioxide. T. MUROOKA and H. HAGISAWA. VI. Reduction by zinc amalgam of solutions of sodium hydrogen sulphite. H. HAGISAWA. VII. Reduction of hydrogen sulphite solution by sodium amalgam. F. ISHIKAWA and N. WATANABE (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 783—790, 791—797, 798—803).—V. Aq. Na_2SO_3 and $ZnSO_3$ were reduced by Zn amalgam in presence of 1 atm. of CO_2 , the reactions $2Na_2SO_3 + 3H_2CO_3 + Zn = Na_2S_2O_4 + 2NaHCO_3 + ZnCO_3 + 2H_2O$, $2ZnSO_3 + 2H_2CO_3 + Zn = ZnS_2O_4 + 2ZnCO_3 + 2H_2O$ occurring. The yields of $Na_2S_2O_4$ and ZnS_2O_4 were determined. Reduction of $ZnSO_3$ was the more difficult owing to low solubility, but could be increased by the use of saturated solutions of $ZnSO_3 \cdot 2.5H_2O$ in aq. Na_2SO_3 , when the reaction $Na_2SO_3 + ZnSO_3 + 2H_2CO_3 + Zn = Na_2S_2O_4 + 2ZnCO_3 + 2H_2O$ occurs.

VI. Aq. $NaHSO_3$ was reduced by Zn amalgam at 10° under 1 atm. of CO_2 . The reaction $4NaHSO_3 + Zn = Na_2S_2O_4 + ZnSO_3 + Na_2SO_3 + 2H_2O$ (i) proceeds completely, and is followed by the reaction $ZnSO_3 + 2H_2CO_3 + Zn = Na_2S_2O_4 + 2ZnCO_3 + 2H_2O$ (ii), which is incomplete probably because of the high concn. of $Na_2S_2O_4$ from (i). The solid $3ZnCO_3 \cdot ZnSO_3 \cdot 2Na_2S_2O_4$ separates. The yield in (ii) may be increased to 70% by the use of 10 atm. of CO_2 , and by shaking.

VII. The max. yield of $Na_2S_2O_4$ (89%) was obtained with dil. aq. $NaHSO_3$ and very dil. Na amalgam. With conc. $NaHSO_3$ a solid phase $Na_2S_2O_4 \cdot 3.5Na_2SO_3 \cdot xH_2O$ separates.

R. S. B.

Potassium nitrosodisulphonate. H. GEHLEN (Ber., 1937, 70, [B], 1980—1981).— $(KSO_3)_2NO$ is determined by observing the vol. of NO required to decolorise a solution of a known wt. of it in $N-NaOH$. The rate of decomp. of $(KSO_3)_2NO$ in $NaOH$ increases with increasing concn. of alkali.

H. W.

Question of the existence of selenium monoxide. P. W. SCHENK (Z. anorg. Chem., 1937, 233, 401—402).—Attempts to prepare SeO were unsuccessful. F. J. G.

Transformations produced at low temperatures ("frigadréactions"). A. DEBIERNE and L. GOLDSTEIN (Compt. rend., 1937, 205, 321—322, 368).—The phenomenon already reported (this vol., 473) for H₂ and C and for He and C is also found with H₂ and Be and with He and Be, Mg, and to a smaller extent Al, but slightly or not at all with He and Ni, Cu, or sand. F. J. G.

Chrome[-tanning] liquors. VI. Reduction of potassium dichromate by sucrose. E. R. THEIS and C. L. WEIDNER (J. Amer. Leather Chem. Assoc., 1937, 32, 424—459; cf. B., 1937, 187).—The oxidation products of the reaction under different conditions, in presence of H₂SO₄, using 0—200% of sucrose (I) > the amount theoretically required to reduce the K₂Cr₂O₇, have been determined. On addition of (I) to a boiling mixture of acid and K₂Cr₂O₇ the CO₂ produced amounted to 70—75% of the theoretical when the final [CrO₃] was 10%, and to 85% when the [Cr₂O₃] was 20%. The amounts of H₂C₂O₄, HCO₂H, and AcOH formed were relatively small. Somewhat similar results were obtained when K₂Cr₂O₇ was added to a boiling mixture of acid and (I), but in an open vessel a greater proportion of masking agents was formed. When acid was added to a boiling mixture of K₂Cr₂O₇ and (I) less CO₂ and more acids were formed, the amount of CO₂ decreasing and that of the acids increasing as the (I) concn. increased. When the liquors were reduced in an open vessel most of the volatile acids were lost. D. P.

Methods of preparation of phosphomolybdic acid. E. A. NIKITINA (J. Appl. Chem. Russ., 1937, 10, 1194—1198).—Phosphomolybdic acid (I) is obtained by Debray's method (Compt. rend., 1868, 66, 702) in small yield, and of variable composition. Drechsel's method, involving double extraction with Et₂O, gives pure (I) in good yield. (I) is obtained in 80—85% yield from MoO₃ and boiling aq. H₃PO₄, followed by Et₂O extraction. R. T.

Preparation of polonium sources. W. R. KANNE (Physical Rev., 1937, [ii], 52, 380).—Strong sources were obtained by deposition on Pd from a 0.1N-HCl solution saturated continuously with H₂. N. M. B.

Existence of chlorous anhydride. C. F. GOOD-EVE and F. D. RICHARDSON (Compt. rend., 1937, 205, 416—417).—Cl₂O₃ is not formed by the action of H₂SO₄ on KClO₃ and undecenoic acid (cf. Kantzer, Compt. rend., 1912, 155, 158), the absorption spectrum showing the product to be ClO₂. A. J. E. W.

Reduction of the oxides of manganese by solid carbon in a vacuum. W. BAUKLOH and O. ZIEBEIL (Z. anorg. Chem., 1937, 233, 424—428).—Mn₂O₄ is easily reduced to MnO by C at 700—900°. MnO is not reduced by C alone in vac. below 1150°, and at this temp. almost all the Mn volatilises. In presence of Fe the reduction begins at 800—900°, much of the Mn again being volatilised. F. J. G.

Rhenium and carbon. W. TRZEBIATOWSKI (Z. anorg. Chem., 1937, 233, 376—384).—Re at 800—2200° in CH₄ takes up about 1% of C with expansion of the lattice. No carbide is formed. Coarse Re powder in CO at 450—1100° takes up C, the lattice expanding more than with CH₄, but above 1100° the lattice returns to the smaller dimensions found in CH₄. Highly active Re, prepared by a special method, forms a carbide when heated in CO at 470—600°, but this is completely decomposed at 1600°. F. J. G.

Amorphous and crystallised oxide hydrates and oxides. XXXV. A rontgenographically amorphous ferric oxide hydrate which does not combine with silver and has little activity. A. KRAUSE [with A. SZELIGA and H. SZCZEKOCKI] (Ber., 1937, 70, [B], 1969—1975).—Short treatment of Fe(OH)₃ gel (I) with boiling N-NaOH gives the polyorthohydroxide (II), which does not age and reacts with Ag; this passes on continued treatment into Fe^{III} oxide hydrate (III), which does not age and does not unite with Ag. (I) dissolves freely in alkaline glycerol, in which (III) is insol. There are thus three rontgenographically amorphous compounds of Fe₂O₃ and H₂O which are of similar appearance but different constitution. Between the two active forms there is no fundamental relationship. Usually the amorphous and colloidal condition implies activity but may be associated with slight activity and unchangeability. Catalytic decomp. of H₂O₂ and ability to unite with Ag do not depend directly on the particle size of the Fe^{III} hydroxide. A coarsely disperse and cryst. hydroxide can be considerably more active than a rontgenographically amorphous and finely divided material. The amorphous condition or ill-marked organisation of the lattice does not necessarily imply the active state. Reactive H atoms exchangeable for Ag are conditional for the catalytic decomp. of H₂O₂. These can be present in cryst. and non-cryst., in ageing and non-ageing hydroxides, the chemical constitution and not the crystal lattice being the decisive factor. Possible constitutions are discussed. H. W.

Molecular structures of iron nitrosocarbonyl Fe(NO)₂(CO)₂ and cobalt nitrosocarbonyl Co(NO)(CO)₃. L. O. BROCKWAY and J. S. ANDERSON (Trans. Faraday Soc., 1937, 33, 1233—1239).—Electron diffraction measurements on Fe(NO)₂(CO)₂ and Co(NO)(CO)₃ vapours indicate that the metal-C and metal-N spacings (about 1.84 and 1.77 Å., respectively) are about 0.16 Å. < the sum of the single bond covalent radii, whilst the C-O and N-O distances are intermediate between those of double and triple linkings. It is suggested that the resonating electronic structure proposed for Ni(CO)₄ (A., 1936, 144) holds for these compounds also. J. W. S.

Metallic carbonyls. XXVI. Action of organic sulphur compounds on the carbonyls of iron and cobalt. W. HIEBER and P. SPACU (Z. anorg. Chem., 1937, 233, 353—364).—[Fe(CO)₄]₃ and [Co(CO)₄]₂ react with RSH (R = Et, Ph) quantitatively thus: M(CO)₄ + RSH = (CO)₃M·SR + CO + 0.5H₂. The products are stable non-electrolytes. In org. solvents they react with o-phenan-

throline which displaces part of the CO. The following compounds have been prepared: $(\text{CO})_5\text{FeSPh}$ (I), m.p. 140° ; $(\text{CO})_5\text{CoSPh}$; $[(\text{CO})_5\text{FeSEt}]_2$ (cf. A., 1928, 1114); $[(\text{CO})_5\text{CoSEt}]_2$; $\text{Fe}(\text{CO})\text{C}_{12}\text{H}_5\text{N}_2\text{SPh}$; $\text{Fe}(\text{CO})\text{C}_{12}\text{H}_5\text{N}_2\text{SEt}$; $\text{Co}(\text{CO})\text{C}_{12}\text{H}_5\text{N}_2\text{SEt}$. (I) in C_6H_6 reacts with I in $\text{C}_5\text{H}_5\text{N}$ to form a compound $\text{FeI}_3\text{SPh}\cdot 2\text{C}_5\text{H}_5\text{N}$. F. J. G.

Stereochemistry of platino-tetrammines. H. D. K. DREW, F. S. H. HEAD, and H. J. TRESS (J.C.S., 1937, 1549—1551).—Attempts to resolve α - and β - $[\text{Pt}(\text{ib})_2\text{Cl}_2]$ and $[\text{Pt}(\text{ib} \text{ mt})\text{Cl}_2]$ ($\text{ib} = \text{NH}_2\cdot\text{CMe}_2\cdot\text{CH}_2\cdot\text{NH}_2$; $\text{mt} = \text{NH}_2\cdot\text{CH}_2\cdot\text{CHMe}\cdot\text{CH}_2\cdot\text{NH}_2$) were unsuccessful. This is to be expected for the former but not for the latter, on the basis of a planar configuration. Compounds: $[\text{Pt}(\text{mtCl}_2)_2]$; $[\text{Pt}(\text{ib} \text{ mt})\text{Cl}_2]$; $[\text{Pt}(\text{ib} \text{ mt})\text{PtCl}_2]$; α - $[\text{Pt}(\text{ib})_2]$ α -bromo-d-camphor- π -sulphonate $[\alpha]^{20}_D +56^\circ$; $[\alpha]^{20}_{5780} +58^\circ$; $[\alpha]^{20}_{5461} +69^\circ$ ($c = 2.5$, in H_2O); β - $[\text{Pt}(\text{ib})_2]$ α -bromo-d-camphor- π -sulphonate monohydrate $[\alpha]^{20}_{5780} +65^\circ$, $[\alpha]^{20}_{51} +68^\circ$ ($c = 1.371$ in H_2O); $[\text{Pt}(\text{ib} \text{ mt})]$ α -bromo-d-camphor- π -sulphonate $[\alpha]^{20}_D +55^\circ$ ($c = 2.59$, in H_2O), $[\alpha]^{20}_{5780} +56^\circ$ ($c = 1.95$), $[\alpha]^{20}_{5461} +68^\circ$ ($c = 1.6$) $[\text{Pt}(\text{ib} \text{ mt})]$ α -nitro-d-camphorate monohydrate, $[\alpha]^{20}_D +165^\circ$, $[\alpha]^{20}_{5780} +173^\circ$, $[\alpha]^{20}_{5461} +206^\circ$ ($c = 1.644$, in H_2O). F. J. G.

Trends of development of [quantitative] spectral analysis. G. S. LANDSBERG (Bull. Acad. Sci. U.S.S.R., 1937, Ser. Phys., 101—112).—The relative accuracy of methods based on internal standards and on the abs. intensity of spectral lines is discussed. J. S. A.

Application of organic reagents and complex compounds in analytical chemistry. J. V. DUBSKY (Mikrochem., 1937, 23, 24—42).—A summary. J. W. S.

Modern ideas in analytical chemistry. J. V. DUBSKY (Mikrochem., 1937, 23, 42—51).—A summary. J. W. S.

Relationships between scientific chemical work and micro-analysis. J. V. DUBSKÝ (Chem. Weekblad, 1937, 34, 599—604).—An historical account of the author's work and contacts with the early development of micro-analytical methods. S. C.

Inorganic chromatography. I. G. M. SCHWAB and K. JOCKERS (Angew. Chem., 1937, 50, 546—553; cf. A., 1936, 810; this vol., 150).—The technique of chromatographic analysis and its application to various separations are described. J. W. S.

Detection and elimination of titration errors. I. A. B. SCHACHKELDIAN (J. Appl. Chem. Russ., 1937, 10, 1302—1309).—10 ml. of 0.1N-KI are added to 10 ml. of aq. KI containing X g. of I (also approx. 0.1N), and the solution is titrated with 0.1N- HgCl_2 (A ml.). The titration is repeated, adding 15 ml. of 0.1N-KI (B ml. of HgCl_2), and the val. of X is calc. from $(X + 10)/(X + 15) = A/B$. This method is of general application to all titrations involving errors due to interfering substances, to formation or dissociation of complexes, or to dilution. R. T.

Photo-electric method of measuring p_H values with indicator solutions. G. F. LOTHIAN (Trans. Faraday Soc., 1937, 33, 1239—1243).—By photo-electric measurement of light absorption, p_H vals. can

be determined to ± 0.02 — 0.04 with suitable indicators. Optimum conditions for the determination are described. J. W. S.

Potentiometric titration in neutralisation reactions, with the system platinum-carborundum (graphite). N. J. CHLOPIN (Zavod. Lab., 1937, 6, 548—550).—Electro-titration of acids and alkalis in presence of glycerol and CrO_4^{2-} is possible using Pt-carborundum electrodes. R. T.

Determination of hydrogen deuteride by means of the micro-thermal conductivity gauge. G. H. TWIGG (Trans. Faraday Soc., 1937, 33, 1329—1333).—The Melville and Bolland micro-thermal conductivity gauge (this vol., 471, 582) has been calibrated for the determination of HD in mixtures of H_2 , D_2 , and HD. The composition-resistance curve is not linear, as would be expected theoretically. The technique has been used to follow the reaction $\text{H}_2 + \text{D}_2 \xrightarrow{2\text{HD}}$ on a Ni catalyst. J. W. S.

Determination of hydrogen, oxygen, and nitrogen in steel.—See B., 1937, 1062.

Rapid determination of water in heat-refractory and other materials, by the distillation method. P. I. DOLINSKI (Zavod. Lab., 1937, 6, 633—634).—25 ml. of turpentine are distilled from 25 g. of powdered material, and the vol. of H_2O in the distillate is determined. R. T.

Determination of moisture in solid substances by measurement of their dielectric constants. S. KNOKE (Z. Elektrochem., 1937, 43, 749—751).—A modified form of the immersion method of measuring ϵ is described. Two equal condensers are enclosed in the same vessel so that the powder can be introduced between the plates of one only; the composition of the immersing liquid is then adjusted until the capacities are equal. Details are given of the application of the method to the determination of the H_2O content of tannin, using C_6H_6 - PhNO_2 mixtures as immersion liquids. J. W. S.

Rapid determination of water in liquid ammonia, using metallic sodium.—See B., 1937, 1042.

Automatic determination of the water content of solid fuels and gases.—See B., 1937, 998.

Detection of bromide and iodide in drugs.—See B., 1937, 1130.

Determination of fluorine.—See B., 1937, 1046.

Determination of traces of fluorine in foods.—See B., 1937, 1127.

Colorimetric determination of hydrogen sulphide in air.—See B., 1937, 1138.

Potentiometric studies in oxidation-reduction reactions. II. Oxidation with potassium iodate. B. SINGH and I. ILAHI (J. Indian Chem. Soc., 1937, 14, 376—380; cf. this vol., 263).— KCNS , $\text{Na}_2\text{S}_4\text{O}_6$, $2\text{N}_2\text{H}_4\cdot\text{H}_2\text{SO}_4$, KMnO_4 , and $\text{K}_2\text{Cr}_2\text{O}_7$ have been determined by potentiometric titrations with KIO_3 in presence of $>4\text{N-HCl}$. R. S. B.

Determination of sulphur and carbon in cast iron and steel.—See B., 1937, 1061, 1062.

Application of salts of complex cations to the microscopical detection of anions. I. Hexamminocobaltic chloride (luteo-cobaltamine chloride). W. A. HYNES and L. K. YANOWSKI (*Mikrochem.*, 1937, **23**, 1—8).—The characteristic cryst. products obtained with $\text{Co}[(\text{NH}_3)_6]\text{Cl}_2$ are recommended as rapid tests for the detection of HSO_3' , CrO_4'' , $\text{Cr}_2\text{O}_7''$, $\text{S}_2\text{O}_6''$, $\text{Fe}(\text{CN})_6'''$, $\text{Fe}(\text{CN})_6'''$, IO_3' , MnO_4' , SO_4'' , sulphosalicylate, and SO_3'' ions. Characteristic ppts. are also obtained with HF_2' , HSO_4' , $\text{Co}(\text{NO}_2)_6'''$, SiF_6'' , I' , VO_3' , $[\text{Fe}(\text{CN})_5\text{NO}]''$, VO_4''' , $\text{S}_2\text{O}_8''$, phosphomolybdate, phosphotungstate, $\text{P}_2\text{O}_7''$, tartrate, and FeO_3'' ions. The cation present does not affect the cryst. form of the product, which is similar whether the salts of these ions occur alone or mixed with other ions. J. W. S.

Volumetric determination of selenium. Critical study of the Norris and Fay method. W. C. COLEMAN and C. R. McCROSKEY (*Ind. Eng. Chem. [Anal.]*, 1937, **9**, 431—432).—Modified procedure is described. The accuracy is 0.1—0.2%. E. S. H.

Electrometric titration of selenates. R. W. GELBACH and G. B. KING (*J. Physical Chem.*, 1937, **41**, 803—807).— H_2SeO_4 can be titrated by means of a glass- Hg_2Cl_2 electrode system. Sol. selenates, with or without free H_2SeO_4 , can be titrated with $\text{Pb}(\text{NO}_3)_2$ using a ferrocyanide-ferriocyanide electrode. With aq. solutions the method is untrustworthy, but data obtained with EtOH of initial concn. 75% are reproducible. C. R. H.

Determination of phosphorus, aluminium, and beryllium in bronzes.—See B., 1937, 1064.

Colorimetric determination of phosphoric acid in fertilisers.—See B., 1937, 1101.

[Determination of chloral hydrate, hypophosphite, phosphite, halogen oxyacids, and phenol.]—See A., II, 477.

Determination of arsenic in mineral oil solutions. J. B. LEWIS and E. L. BALDESCHWIELER (*Ind. Eng. Chem. [Anal.]*, 1937, **9**, 405—406).—The sample is digested with H_2SO_4 , HNO_3 , and K_2SO_4 in a Kjeldahl flask, As is pptd. by H_2S , oxidised with H_2O_2 , and then pptd., ignited, and weighed as $\text{Mg}_2\text{As}_2\text{O}_7$. E. S. H.

Determination of arsenic in ores.—See B., 1937, 1063.

Quantitative spectral analysis of electrolytic copper for arsenic, antimony, bismuth, tin, lead, and iron.—See B., 1937, 1069.

Determination of boric acid in foodstuffs.—See B., 1937, 1127.

Rapid determination of silicon and graphite in cast iron.—See B., 1937, 1061.

Determination of silica in ferrous metals.—See B., 1937, 1061.

Colorimetric determination of silicon in magnesium.—See B., 1937, 1066.

Simultaneous determination of silicon and chromium in ferrochromium.—See B., 1937, 1062.

Determination of silica in siliceous materials.—See B., 1937, 1049.

Titration of carbonates. A. F. KITCHING (*Analyst*, 1937, **62**, 664).—The lag of attainment of equilibrium in the titration of Na_2CO_3 with acids in dil. solution, observable with phenolphthalein, is shown also by bromocresol-purple and bromothymol-blue. J. S. A.

Colorimetric determination of carbon disulphide in gas or motor fuels.—See B., 1937, 1002.

Determination of carbon disulphide.—See B., 1937, 1016.

Rapid determination of inactive gases in nitrogen. J. A. M. VAN LIEMPT and W. VAN WIJK (*Rec. trav. chim.*, 1937, **56**, 755—759).—The N_2 is absorbed by Li at 420° . The apparatus described permits 20 analyses per hr. to be made with an accuracy of $\pm 5\%$. F. L. U.

Systematic analysis of cations without the use of hydrogen sulphide. V. KRASNOVA (*J. Appl. Chem. Russ.*, 1937, **10**, 1290).—Minor modifications of Ravitsch's method (A., 1899, ii, 578) are described. R. T.

Microchemical detection of certain metals in alloys.—See B., 1937, 1065.

Analysis of cations of the first analytical group, with the use of formaldehyde. P. VUKOLOV (*J. Appl. Chem. Russ.*, 1937, **10**, 1288—1289).— NH_4^+ and Mg are detected in the usual way. A portion of solution is conc. to small vol., an equal vol. of 40% aq. CH_2O is added to remove NH_4^+ , and K^+ and Na^+ are detected in the usual way. R. T.

Development of electro-drop analysis. III. H. FRITZ (*Mikrochem.*, 23, 61—78; cf. this vol., 326, 426).—The effects of the presence of HCl or NH_3 on the detection of Ag, Hg, Au, and Pt by drop tests on polished Cu are discussed. J. W. S.

Simultaneous determination of calcium and magnesium by volumetric potentiometry. G. BERRAZ and C. CHRISTEN (*An. Soc. cient. Argentina*, 1935, **120**, 103—107).—In absence of CO_2 , pptn. of Ca by 0.1N- Na_2CO_3 is almost quant., whereas basic Mg carbonate is sol. Known vols. of 0.1N- Na_2CO_3 and 0.1N-NaOH are added in turn to the CO_2 -free solution containing Mg and Ca salts, the ppt. is filtered, and Na_2CO_3 and NaOH are determined potentiometrically in the filtrate. CH. ABS. (e)

Rapid analysis of baryte ores.—See B., 1937, 1044.

Rapid determination of barium silicofluoride.—See B., 1937, 1044.

Analysis of aerosols. Absorption and determination of zinc salts and free acid in mists. D. N. FINKELSCHTEIN (*J. Appl. Chem. Russ.*, 1937, **10**, 1266—1280).— H_2SO_4 and ZnSO_4 in air are collected by passage at a linear velocity of ≤ 30 cm. per sec. through filter-paper. The paper is extracted with H_2O , and the extract is titrated with 0.004N-NaOH (Me-red); Zn does not interfere. Zn ($\leq 3 \times 10^{-6}$ g.) is determined nephelometrically, as $\text{K}_2\text{Zn}_3[\text{Fe}(\text{CN})_6]_2$, in a medium containing H_2SO_4

0.7N and $(\text{NH}_4)_2\text{SO}_4$ 0.5M, with addition of a few drops of aq. Na_2SO_3 ; Fe and Cu interfere, and directions for their elimination are given. R. T.

Rapid determination of lead in lead-zinc ores, etc.—See B., 1937, 1064.

Rapid determination of metallic lead in litharge.—See B., 1937, 1045.

Detection and determination of organo-metallic compounds, especially of lead tetraethyl and nickel carbonyl.—See B., 1937, 1131.

Colorimetric determination of copper with sodium diethyldithiocarbamate in presence of moderate amounts of iron. T. P. HOAR (Analyst, 1937, 62, 657—661).—The interference caused by ≥ 25 parts of Fe per part of Cu, in presence of Zn, may be eliminated by adding citric acid (I) + aq. NH_3 . The total coloration is then determined, and the coloration due to the Fe found by the addition of (I) + NH_3 , without $\text{NET}_2\cdot\text{CS}_2\text{Na}$, to a separate sample. The effect of a larger amount (25—100 parts) of Fe may be suppressed by adding $\text{Na}_4\text{P}_2\text{O}_7$, but the presence of Zn then interferes. J. S. A.

Electrolytic determination of copper in copper-arsenic preparations.—See B., 1937, 1073.

Determination of copper in cast iron and steel by means of dibromohydroxyquinoline.—See B., 1937, 1061.

Detection of colloidal cerium oxalate in drugs.—See B., 1937, 1130.

Fluorescent test for aluminium. C. E. WHITE and C. S. LOWE (Ind. Eng. Chem. [Anal.], 1937, 9, 430—431).— Al^{+++} (0.2 p.p.m.) can be detected in presence of Be and other associated elements by the orange-red fluorescence produced by Pontachrome Blue Black R in ultra-violet light. Highly coloured ions mask the effect and should be removed by adding excess of NaOH, filtering, and then adding AcOH. E. S. H.

Determination of aluminium, iron, and titanium in silicates.—See B., 1937, 1049.

Determination of alumina in iron ores and of aluminium in steel.—See B., 1937, 1058, 1062.

Analysis of cryolite.—See B., 1937, 1045.

Rapid titrimetric determination of manganese in aluminium and aluminium alloys.—See B., 1937, 1066.

Determination of manganese in cobalt.—See B., 1937, 1064.

Gravimetric determination of iron and aluminium by precipitation as hydroxide with ammonia, in presence of calcium, barium, and magnesium. V. K. ZOLOTUCHIN (J. Appl. Chem. Russ., 1937, 10, 1291—1295).—Fe and Al hydroxides are pptd. by a slight excess of NH_3 , and the ppt. is washed with 2% aq. NH_4NO_3 ; Ca, Ba, and Mg do not interfere. R. T.

Mercurimetric titration of nitroprusside. O. TOMÍČEK and J. KUBÍK (Coll. Czech. Chem. Comm., 1937, 9, 377—387).— $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$ can be titrated potentiometrically with $\text{Hg}_2(\text{ClO}_4)_2$, using a Hg

electrode. The potentials are unstable at first but become steady as the equivalence-point is approached. In the inverse titration the potentials are always steady. The potential "jump" is not very large but can be increased by addition of EtOH. From the mean val. of the equivalence potential the solubility of $\text{Hg}_2[\text{Fe}(\text{CN})_5\text{NO}]$ is 4×10^{-5} g.-mol. per litre. F. J. G.

Influence of the nature and concentration of the electrolyte on the height of the Fe^{II} -ion wave in polarographic analysis. E. S. BURKSER and S. G. MICHLIN (Ukrain. Chem. J., 1937, 12, 369—373).— Fe^{II} may be determined polarographically in conc. aq. Li, Na, NH_4 , K, Rb, Ca, Sr, and Ba chlorides; the height of the wave obtained \propto concn. of the electrolyte and diameter of its cation. R. T.

Polarographic determination of iron.—See B., 1937, 1007.

Determination of iron with 7-iodo-8-hydroxyquinoline-5-sulphonic acid. H. W. SWANK [with M. G. MELLON] (Ind. Eng. Chem. [Anal.], 1937, 9, 406—409).—The best conditions for determining Fe colorimetrically by means of "Ferron" have been determined by spectrophotometric analysis. The colour depends on the reagent concn. and on p_H . Whilst p_H 2.0—3.0 is suitable the val. should be kept within 0.2 unit for a series of comparisons. KH phthalate, glycine, or NaOAc, but not citrates or phosphates, are suitable buffers. The colour is stable for ≤ 1 week. The interference due to other ions and the influence of p_H thereon are discussed. E. S. H.

Determination of small amounts of iron in mercury.—See B., 1937, 1065.

Rapid analysis of ferrosilicon.—See B., 1937, 1062.

Analysis of alloy steel.—See B., 1937, 1062.

Determination of ferrous oxide in chromite.—See B., 1937, 1045.

Colorimetric determination of chromate solutions. N. VAVILOV (Ukrain. Chem. J., 1937, 12, 293—303).—0.3 ml. of 1% $p\text{-NH}_2\cdot\text{C}_6\text{H}_4\cdot\text{OEt}\cdot\text{HCl}$ in 0.045N-HCl is added to 0.1—0.2 ml. of solution, followed after 1 min. by H_2O to 100 ml., and the coloration is compared with that given by 0.1 ml. of 0.1N- $\text{K}_2\text{Cr}_2\text{O}_7$. PO_4^{+++} , SiO_3^{++} , and powerful reducing and oxidising agents interfere, and tap- H_2O should not be used for dilution. The coloration remains const. for 30 min. The colour reagent is stable. R. T.

Determination of chromium and manganese present together. N. V. LAZAREV (Zavod. Lab., 1937, 6, 627—628).—The method of Lang and Kurtz (A., 1932, 36) is adapted to analysis of minerals. R. T.

Determination of chromium in presence of vanadium in titanomagnetite ore.—See B., 1937, 1065.

Determination of chromium in ferrochrome.—See B., 1937, 1062.

Rapid determination of molybdenum in steels.—See B., 1937, 1062.

Potentiometric determination of molybdenum in ferromolybdenum.—See B., 1937, 1063.

Rapid determination of oxidised and non-oxidised molybdenum in roasted ore.—See B., 1937, 1065.

Analysis of molybdenum.—See B., 1937, 1065.

Determination of tin by means of phenylarsinic acid. I. P. ALIMARIN and M. S. VESHENKOVA (Zavod. Lab., 1937, 6, 644—645).—Polemical, against Sirokanski and Pilnik (B., 1937, 570).

R. T.

Colorimetric determination of tin by means of toluene-3:4-dithiol ("dithiol"). R. E. D. CLARK (Analyst, 1937, 62, 661—663).—Sn is reduced completely to Sn²⁺ by the addition of SH·CH₂·CO₂H (I), and the solution is diluted to contain >60 mg. of Sn per litre. HCl and agar (as stabilising colloid) are added, and then a solution of 0.2 g. of "dithiol" in 100 ml. of 1% NaOH containing 0.3—0.5 g. of (I). The sample is heated at 100° for 1 min., and the red colour developed is colorimetrically determined. J. S. A.

Decomposition of tin ores containing cassiterite.—See B., 1937, 1064.

Determination of tin in lead and in ores.—See B., 1937, 1064.

Determination of tin in ferromolybdenum.—See B., 1937, 1063.

Determination of titanium and its dioxide in acid-resistant steel.—See B., 1937, 1062.

Detection of small amounts of niobium and tantalum in minerals, rocks, and metals. I. P. ALIMARIN and B. I. FRIED (Mikrochem., 1937, 23, 17—23).—Nb and Ta yield white, sparingly sol. ppts. when treated with PhO·As(OH)₂ in strongly acid solution containing tartaric acid. This method permits the detection of 2×10^{-6} g. of Nb₂O₅ + Ta₂O₅ per c.c. The method has been applied to detection of Nb in minerals, rocks, and steels, but is interfered with in the presence of excessive amounts of Sn, Zr, or Ti. The last two can be separated previously with pyrogallol. J. W. S.

Determination of gold and platinum and detection of platinum metals. S. O. THOMPSON, F. E. BEAMISH, and M. SCOTT (Ind. Eng. Chem. [Anal.], 1937, 9, 420—422).—The composition of the crystals formed by PtCl₄ with dimethylglyoxime (I) corresponds with PtC₈H₁₄N₄O₄. (I) can be used for the determination of Au, but not of Pt. The efficiency of various reagents for the detection of Pt metals and Au is discussed. Pyrogallol and ephedrine hydrochloride can be used as qual. tests for Os. E. S. H.

Low-temperature thermostat. L. C. BEADLE and F. A. BOOTH (Nature, 1937, 140, 279).—The arrangement described maintains a const. temp. to within 0.1° over the range 4—10°. Working at 5° it consumes approx. 0.5 cwt. of ice in 100 hr.

L. S. T.

Constant temperature: principles in electric thermostat design: a mains-operated isothermal chamber constant to 0.001°. L. B. TURNER (J. Inst. Elect. Eng., 1937, 81, 399—422).—A detailed

survey of the relation between "hunting," associated with delayed action in all forms of apparatus, and the design of electrically operated devices. An apparatus designed to obtain the smallest possible inconstancy consistent with derivation of supplies from a.c. mains alone, and in accord with the principles deduced, is described. N. M. B.

Thermal conductivity method for the determination of isotopic exchanges in the simpler gaseous molecules. N. R. TRENNER (J. Chem. Physics, 1937, 5, 751).—Erratum (cf. this vol., 479).

W. R. A.

Quantitative fluorescence-photometric micro-analysis. I. Fluorescence-photometer for use with visible and ultra-violet light. H. MINIBECK (Biochem. Z., 1937, 293, 219—227).—With the apparatus described determinations may be made with an error of $\pm 2-3\%$. Materials which fluoresce in visible and ultra-violet light are best examined in visible light only. W. McC.

Can the exposure in structure analysis [by X-rays] be shortened? C. J. KROM and H. B. VAN DER SPENKEL (Rec. trav. chim., 1937, 56, 760—765).—By the use of more sensitive film and suitable fluorescent screens exposure may be reduced to one fifth of the usual time. F. L. U.

Seeman-Bohlin X-ray camera for high temperatures. R. F. BOYER and C. NUSBAUM (Physical Rev., 1936, [ii], 49, 884).—An arrangement for the X-ray analysis of the cementite and graphite pptn. in cast Fe at high temp. is described. L. S. T.

Absorption factor for the rotating-crystal method of crystal analysis. O. P. HENDERSHOT (Rev. Sci. Instr., 1937, [ii], 8, 324—326; cf. Bradley, A., 1935, 1306).—Mathematical. The problem for the case of a crystal used in its natural shape is examined. Results and their use with highly absorbing crystals are given. N. M. B.

Source for quantitative spectrographic analysis of solutions. K. B. THOMSON and O. S. DUFFENACK (Physical Rev., 1936, [ii], 49, 880—881).—The source described has been applied to the analysis of biological fluids. Concn. ranges are Mg 0.0001—0.05, Na 0.01—1.0, K 0.025—0.8, and Ca 0.005—0.1%.

L. S. T.

Electrical discharge as an aid in chemical synthesis. P. W. SCHENK (Angew. Chem., 1937, 50, 535—546).—A summary of recent work on the use of electric discharges in preparative chemistry. J. W. S.

Testing of materials by the high-velocity electron diffraction method. Z. G. PINSKIER (Zavod. Lab., 1937, 6, 572—579).—Electron scattering methods are recommended for the study of surface films and layers. R. T.

Halide reference half-cells in p_H determinations. W. J. HAMER (Trans. Electrochem. Soc., 1937, 72, Preprint 19, 257—281).—A discussion of the problems encountered, with special reference to liquid junction potentials. F. R. G.

Temperature and hysteresis errors in calomel half-cells. B. WINGFIELD and S. F. ACREE (J. Res.

Nat. Bur. Stand., 1937, **19**, 163—175).—The variation with temp. of the e.m.f., and the time lag in the attainment of the equilibrium e.m.f., of saturated and unsaturated KCl-Hg₂Cl₂ half-cells have been investigated. Both are more important in unsaturated than in saturated cells. Hysteresis errors of 0.9 mv. were observed during a temp. change of 8°. The importance of these sources of error is emphasised. Minor fluctuations can be eliminated by enclosing the half-cell in a Dewar vessel. O. D. S.

Measurement of direct potentials originating in circuits of high resistance. R. H. CHERRY (Trans. Electrochem. Soc., 1937, **72**, Preprint 12, 173—184).—Apparatus is described in which the "inverted triode" thermionic valve is applied to measurements of difference in potential in circuits having resistances $>10^{11}$ ohms. Applications are discussed. J. W. C.

Relay-free mercury vapour triode control for a constant-temperature water-bath. H. S. SCHWENK and D. E. NOBLE (J. Physical Chem., 1937, **41**, 809—810).—A circuit which will maintain temp. to $\pm 0.005^\circ$ is described. C. R. H.

Valve galvanometer for glass electrodes. H. KOTHE (Z. Spiritusind., 1937, **60**, 257). J. S. A.

Antimony electrode in p_H measurements. T. R. BALL (Trans. Electrochem. Soc., 1937, **72**, Preprint 17, 235—247).—For the Sb-Sb₂O₃ electrode, p_H at 20° is given by $(E + 0.020)/0.058$ with an error of ± 0.06 between the limiting p_H vals. 2—7. No serious variation due to the source of the Sb could be detected, whilst greater uniformity is secured by the use of Sb₂S₃, when p_H is given by $(E + 0.0148)/0.0577$ with an error of ± 0.04 over the range 2—10. The sulphide electrode cannot be used with citrate buffers but 10% sugar, 2% starch, and 0.5M-NaNO₃ solutions are without deleterious effect. F. R. G.

Sensitive glass electrode of durable form. A. E. CAMERON (Ind. Eng. Chem. [Anal.], 1937, **9**, 436). E. S. H.

Ballistic method of determining p_H with a glass electrode. V. A. PTSCHELIN and A. C. FAIZULINA (Zavod. Lab., 1937, **6**, 616—619).—A ballistic potentiometer for p_H measurements is described. R. T.

Metallised glass electrodes. P. A. KRIUKOV and A. A. KRIUKOV (Zavod. Lab., 1937, **6**, 619—621).—A special glass bulb is coated internally with Wood's alloy, and the metallic coating is covered with a layer of ceresin. This type of electrode combines high mechanical strength with low resistance. R. T.

Micro-thermal conductivity gauges. J. L. BOLLAND and H. W. MELVILLE (Trans. Faraday Soc., 1937, **33**, 1316—1329; cf. this vol., 471).—Thermal conductivity cells of 0.05 c.c. capacity which are suitable for the micro-analysis of 0.005 c.c. (at n.t.p.) of binary mixtures of gases of different conductivities are described. A theory is developed to account for the behaviour of the gauge when filled with H₂, D₂, and H₂-D₂ and H₂-HD-D₂ mixtures, and conditions are defined so that a gauge will or will not discriminate between equilibrated and non-equili-

brated H₂-D₂ mixtures. The optimum conditions for analysis of mixtures of *o*- and *p*-H₂ have been worked out. By utilising the variation of rotational sp. heats of H₂ and D₂ with temp., a method is developed for analysis of ternary mixtures containing H₂, D₂, and another constituent not condensed in liquid air (CO, CH₄, O₂, N₂, or inert gas) or H₂ and two other gases of different thermal conductivities. J. W. S.

Determination of the concentration of liquids by means of conductivity measuring apparatus. F. LIENEWEG and O. DOBENECKER (Siemens Z., 1937, **17**, 172—177).—An apparatus for determining the electrical conductivity of electrolytes is diagrammatically described, and the applications of conductivity measurements are discussed. R. B. C.

(A) Cloud chamber. (B) Light source for cloud chamber illumination. H. R. CRANE and J. C. MOUZON (Rev. Sci. Instr., 1937, [ii], **8**, 351, 351—352).—(A) A simple apparatus with controlled expansion speed and variable expansion ratio, 1—1.4, is described.

(B) The source consists of a W wire under slight tension flashed in a tube through which N₂ flows continuously. N. M. B.

Time delay circuit for operating Wilson cloud chambers. C. C. JONES (Rev. Sci. Instr., 1937, [ii], **8**, 319—322).—All switching operations are performed by grid glow tubes with time delay inputs. The cycle can be initiated either at regular intervals (by a motor and reduction gear) or by coincidences in Geiger counters above and below the chamber.

N. M. B.

Efficiency of counters and counter circuits. A. E. RUARK and F. E. BRAMMER (Physical Rev., 1937, [ii], **52**, 322—324).—Mathematical. New formulæ for correcting counter data for particles missed because of the finite recovery times of the counter and its recording circuits are derived to apply to a wide range of conditions realised in practice. N. M. B.

Photo-electric spectrophotometer. F. H. COATES (Canad. Chem. Met., 1937, **21**, 305—306).—Instability due to high amplification is avoided by a new arrangement using two cells of the generating type in parallel, the increased initial output enabling lower amplification to be used. A. K. G. T.

Electrical properties of solids. I. Experimental methods. R. M. FUOSS (J. Amer. Chem. Soc., 1937, **59**, 1703—1707).—Procedure for determining abs. vals. of ϵ of solids is described and the elimination of errors due to imperfect contact between sample and electrodes explained. ϵ of fused quartz is 3.810. The vals. for Pyrex glass vary with temp. and frequency. E. S. H.

Perfect e/m filter as a mass spectrograph. J. A. HIPPLE, jun., and W. BLEAKNEY (Physical Rev., 1936, [ii], **49**, 884).—An arrangement of charged particles in uniform and crossed electric and magnetic fields, which serves as an ideal e/m filter and can be used as a mass spectrograph, is described. L. S. T.

Lithium ion source [for nuclear work]. C. A. WHITMER and M. L. POOL (Physical Rev., 1936, [ii], **49**, 882). L. S. T.

Universal ion source. L. P. SMITH and H. A. CARLOCK (Physical Rev., 1936, [ii], 49, 646).

L. S. T.

Apparatus for the automatic analysis of fluctuations in radioactive disintegration. R. L. DRISCOLL (Physical Rev., 1936, [ii], 49, 877).

L. S. T.

Apparatus for the measurement of artificial radioactivity. S. N. VAN VOORHIS (Physical Rev., 1936, [ii], 49, 889).—An apparatus for the more accurate determination of the decay curves of artificial radioactive substances is described. The half-lives of radio-Na, -Cl, and -N, produced by deutron bombardment of NaF, LiCl, soot or Acheson graphite, respectively, are 14.8 hr., 37.0, and 10.0 min. L. S. T.

Reagent bottle with an automatic zero-point burette, without a stand. E. V. PERVUSCHIN (J. Appl. Chem. Russ., 1937, 10, 1321—1324).—Apparatus is described. R. T.

Device for testing hæmocytometers and other pipettes of small capacity. E. L. PEFFER (J. Res. Nat. Bur. Stand., 1937, 19, 177—180).—Apparatus allowing of rapid volumetric testing accurate to about 0.6% is described. O. D. S.

Semi-micro gas evolution apparatus applied to kinetic studies in heavy water. J. GREENSPAN, V. K. LA MER, and S. LIOTTA (J. Amer. Chem. Soc., 1937, 59, 1606—1608).—Apparatus and procedure for precision measurements are described. The rate of decomp. of $\text{H}_2\text{N}_2\text{O}_2$ in aq. D_2O at 25° has been determined. E. S. H.

Automatic compensation of flowmeters for pressure variations. R. K. TAYLOR (J. Amer. Chem. Soc., 1937, 59, 1605).—A device for maintaining const. delivery rates, irrespective of pressure variations at the flowmeter outlets, is described. E. S. H.

Burette clamp. G. R. KOKASCHINSKI and V. A. SEREDKINA (Zavod. Lab., 1937, 6, 636). R. T.

Pressure control and indicator. T. J. KILLIAN (Physical Rev., 1936, [ii], 49, 647).—A new type of electronic vac. gauge, which is sensitive to indicate or control pressure, has been developed. L. S. T.

Flux balance for the measurement of magnetic susceptibilities in alternating fields of low intensity. L. G. HECTOR and G. R. ECKSTEIN (Physical Rev., 1936, [ii], 49, 643).—Susceptibilities of a no. of paramagnetic substances have been measured at frequencies from 60 to 5000 cycles per sec. in fields of ≥ 16 oersteds by the balance described. L. S. T.

Pneumatic collar for the McBain sorption balance. K. V. TSCHMUTOV and A. T. CHALESOVA (J. Appl. Chem. Russ., 1937, 10, 1325—1326).—Apparatus is described. R. T.

Approximate aerodynamic method of determination of mol. wt. of volatile liquids and their mixtures. A. JUZICHIN (J. Appl. Chem. Russ., 1937, 10, 1281—1287).—The aerodynamic method, using a Ranarex gas analyser, serves for the approx. determination of the mol. wt. of solvents. R. T.

Micro-flotation method for the precise comparison of liquid densities and its application to a

preliminary investigation of the distribution of heavy water in certain salt hydrates and to other matters. J. S. ANDERSON, R. H. PURCELL, T. G. PEARSON, A. KING, F. W. JAMES, H. J. EMELÉUS, and H. V. A. BRISCOE (J.C.S., 1937, 1492—1501).—The apparatus enables precise comparisons of d to be made on samples of a few c.c. Observations on the D content of H_2O from various sources, and particularly from cancerous tissues, are recorded. Hydrated CuSO_4 preferentially retains H_2O on dehydration, and considerable interchange occurs in the solid phase below 100° . Amine hydrochlorides exchange all H directly linked to N when dissolved in heavy H_2O . With cobaltammines the exchange is complete but occurs at a measurable rate. F. J. G.

Removal of static charges from glassware, using a high-frequency discharge. F. W. VAN STRATEN and W. F. EHRET (Ind. Eng. Chem. [Anal.], 1937, 9, 443—445).—The influence of electric charges on the apparent wt. of glass vessels is discussed. The charge can be removed before weighing by holding the vessel in a region of silent discharge for <1 min. E. S. H.

Wood's metal reductor. G. F. SMITH and C. S. WILCOX (Ind. Eng. Chem. [Anal.], 1937, 9, 419—420).—The reducing properties of Wood's metal have been investigated. An advantage over Bi, Cd, or Pb liquid amalgams is the easy removal of the alloy after solidification. Results for the determination of Fe are given. E. S. H.

Burette-filling device for portable reagent reservoirs. N. E. RIGLER (Ind. Eng. Chem. [Anal.], 1937, 9, 436). E. S. H.

Fractional distillation micro-apparatus. L. C. CRAIG (Ind. Eng. Chem. [Anal.], 1937, 9, 441—443).—The apparatus is designed for use with 0.5—2.0-g. samples. Results for the separation of binary org. liquid mixtures are reported. E. S. H.

Distilling apparatus for separation of isotopes. G. B. PEGRAM, H. C. UREY, and J. HUFFMAN (Physical Rev., 1936, [ii], 49, 883).—The apparatus described separates constituents of close b.p., e.g., H_2O and D_2O , or H_2^{16}O and H_2^{18}O . The ratio of concn. of the latter pair was changed by a factor of 1.31 at atm. pressure. L. S. T.

Automatic control of a stream of air produced by an ordinary suction pump. G. F. ASPREY (Ann. Bot., 1937, 1, 567—568).—By means of the valve described fluctuations in air flow caused by changes in H_2O pressure are eliminated. A. G. P.

Torsion manometer for the measurement of the force of a molecular ray. M. J. COPLEY and V. DEITZ (Rev. Sci. Instr., 1937, [ii], 8, 314—317).—The quartz torsion fibre is sputtered with Ag to conduct away electrical charges, and the beam is intercepted by a small Al vane. The measurement of v.p. of KCl and CsI crystals in the temp. range 800 — 950° K. is described and discussed (cf. A., 1936, 1331). N. M. B.

Relative humidity nomograph. S. M. TROXEL (Rev. Sci. Instr., 1937, [ii], 8, 350).—The nomograph

is based on the equation of Brooks (cf. A., 1935, 599).
N. M. B.

Viscosimeter with suspended level.—See B., 1937, 988.

Drainage error of viscosimetry of aqueous solutions. G. JONES and R. E. STAUFFER (J. Amer. Chem. Soc., 1937, 59, 1630—1633).—Apparatus for measuring the drainage of liquids in viscosimeters and pipettes as a function of time of outflow, shape and size of the glass surface, and properties of the liquid is described. For a given surface the after-drainage vol. \times outflow time \propto the kinematic viscosity of the liquid.
E. S. H.

Anti-aerosol filters of esparto pulp. Protection of anti-aerosol filters against moisture by a layer of dehydrating material. L. DAUTREBANDE, P. ANGENOT, and E. DUMOULIN (Compt. rend., 1937, 205, 329—330).—The resistance of the filters to

piercing is greatly increased by the use of a protective layer of SiO_2 gel or active charcoal.
F. J. G.

Carborundum ultrafilters. J. DUCLAUX and M. AMAT (Compt. rend., 1937, 205, 315—316).—A layer of finely divided SiC can be used as an ultrafilter.
F. J. G.

Production of thin gold films. C. S. GIBSON (Nature, 1937, 140, 279—280).—Au is deposited as a coherent film on glass and other surfaces at room temp. from solutions of organo-Au compounds or their derivatives in a suitable solvent, such as EtOH, to which alkali is added.
L. S. T.

Early history of phosphorus. J. R. PARTINGTON (Sci. Progr., 1936, 30, 402—412).
CH. ABS. (e)

Life and work of Henry de Chatelier (1850—1936). P. PASCAL (Bull. Soc. chim., 1937, [v], 4, 1557—1611).

Geochemistry.

Electrical conductivity of air in Madrid. A. DUPIERRE and J. M. VIDAL (Anal. Fis. Quim., 1937, 35, 5—20).—The conductivity quotient κ_-/κ_+ is subject to an annual variation having its max. in April.
F. R. G.

Variations in the quantity of ozone in the atmosphere in the neighbourhood of Shanghai. P. LEJAY (Compt. rend., 1937, 205, 307—309).—The variation from month to month is very regular and can be correlated with meteorological conditions.
F. J. G.

Radioactivity of air included in the snow layer near the soil on mountains. H. GARRIGUE (Compt. rend., 1937, 205, 420—422; cf. A., 1935, 468).—The Rn contents of 16 samples of air are recorded, and the observed enrichment is correlated with the wind conditions.
A. J. E. W.

Determination of radon and thoron in the subsoil air at Sante Fé. F. E. URONDO (An. soc. cient. Argentina, 1935, 120, 108—112).—Vals. found are slightly $>$ those reported for other localities.
CH. ABS. (e)

Composition of the mixture of rare gases from the hot springs of Bath. M. W. TRAVERS (J.C.S., 1937, 1561—1562).—The rare-gas residue (about 13 c.c. per litre of gas) consists of A with about 0.1% Ne and about 12% He. The He must originate from radioactive change.
F. J. G.

Consumption of oxygen in sea-water under controlled laboratory conditions. H. R. SEIWELL (Nature, 1937, 140, 506—507).—Determinations of the amount of O_2 disappearing after 10 days from sea- H_2O kept under controlled conditions indicate that conditions in the sea, other than temp., restrict the rate of O_2 consumption.
L. S. T.

Bromine content of the water of the Sea of Japan. V. V. VASILIEV (J. Appl. Chem. Russ., 1937, 10, 1296—1301).—The experimentally determined Br content is in good agreement with that

calc. from the formula $100x/y = 0.347$, where x and y are the Br and Cl contents, in mg. per kg.
R. T.

Hydrocatalase of the mineral springs in Korytnice. R. ŘETOVSKÝ (Chem. Obzor, 1937, 12, 1—5; cf. A., 1936, 1471).—The H_2O of the spring "Zofie" has a fairly const. p_H of 6.0, probably owing to buffering by HCO_3^- and CO_2 , and contains a considerable quantity of Fe and Mn. The rate of decomp. of H_2O_2 , which is rapid with fresh H_2O , rapidly decreases with the age of the H_2O , although H_2O 9 months old still showed hydrocatalase quite distinctly. The high initial activity and long life may be due to Mn, which enters into the kinetics of the reaction.
F. R.

Isotopes of potassium and lithium in Saratoga mineral water and cryptozoon. A. K. BREWER and O. BAUDISCH (J. Amer. Chem. Soc., 1937, 59, 1578—1579).—Determination of the abundance ratios shows an appreciable concn. of ^{41}K in the mineral H_2O and a small concn. in the cryptozoon formations, but the ratio for Li is unchanged.
E. S. H.

Chemical analysis of thirty Peruvian mineral waters. V. CARCAMO MARQUEZ (Bol. Soc. Quím. Peru, 1937, 3, 15—45).—An extension of earlier work (A., 1935, 60) to a no. of other Peruvian sources. The high Li content is notable.
F. R. G.

Chemical and physico-chemical investigations of the mineral waters of the Perla (Piza). U. SBORGI and A. GALANTI (Annali Chim. Appl., 1937, 27, 213—232).—Various data are recorded and the activities of the ionic constituents have been calc. The amounts of Sr^{++} , Ba^{++} , Li^+ , K^+ , and Mn^{++} are notable.
O. J. W.

Mineral water from Canne in Puglie. G. BUODO (Annali Chim. Appl., 1937, 27, 251—256).—The H_2O is bacteriologically pure and notably radioactive; it contains Br^- without any I^- , and traces of borates.
O. J. W.

Glycylglycine as a sea-water buffer. A. TYLER and N. H. HOROWITZ (Science, 1937, 86, 85—86).—Glycylglycine (I) can be used as a satisfactory buffer between p_H 7 and 9 in carbonate-free sea- H_2O . PO_4''' is useful only at a low p_H since Ca^{++} and Mg^{++} are pptd. from sea- H_2O at higher p_H vals. The titration curve with a glass electrode reproduced for 0.025M-(I) in carbonate-free sea- H_2O gives pK' 8.1 at 18.5°. The effect on the development of freshly-fertilised sea urchin eggs in carbonate-free sea- H_2O containing various concns. of (I) is described. L. S. T.

Distribution of potassium in nature. H. HARRASSOWITZ (Kali, 1937, 31, 103—106, 124—127).—Examination of published data shows that the K:Na ratio is >1 in sedimentary rocks and dry soil, plant cells, and the human body, and <1 in mineral waters, rivers, damp soil, sea- H_2O , and marine plants. K is thus the characteristic alkali cation of the land, Na of the sea. This is attributed to the higher chemical reactivity of K, its greater ease of adsorption, and pptg. action on colloid systems. R. C. M.

Carbon in nature. W. NODDACK (Angew. Chem., 1937, 50, 505—510).—A lecture. The geochemistry and distribution of C, and the C cycle in nature, are discussed. J. W. S.

Mineralogy of W. Australia. X. E. S. SIMPSON (J. Roy. Soc. West. Australia, 1936—37, 23, 17—35).—Descriptions and chemical analyses are given for almandine from Marvel Loch, anthophyllite from Mt. Palmer and Marvel Loch (with analyses of related rocks), daphnite, Mt. Satirist and Kalgoorlie; chloritoid mica-schist, Mt. Magnet; columbite and manganocolumbite, McPhee's Range; dufrenite, Gingin; elbaite, Ravensthorpe; gahnite, Goyamin Pool; grossularite, Melville, Toodyay, and Meier's Find; hæmatite (hydrohæmatite), Inglehope; and pisanite, Ravensthorpe. L. S. T.

Crystal structure of plazolite. A. PABST (Amer. Min., 1937, 22, 861—868).—X-Ray diffraction patterns give a 12.14 ± 0.01 Å. with 8 mols. in the body-centered unit cube. The structure is similar to that of grossularite (I). An at. arrangement in the space-group O_h^8 , which satisfactorily accounts for the diffraction data, is given. (I) from Georgetown, California, has a 11.85 ± 0.01 Å., 3.60, and d_{obs} 3.55. L. S. T.

Unit cell and space-group of sternbergite, $AgFe_2S_3$. N. W. BUERGER (Amer. Min., 1937, 22, 847—854).—A Weissenberg study of sternbergite (I) from Joachimsthal, Bohemia, shows that a new orientation is necessary (cf. A., 1936, 817). This gives a 6.61, b 11.64, c 12.67 Å., with 8 $AgFe_2S_3$ per cell; space-group Ccm (C_{2h}^{12}) or $Ccmm$ (D_{2h}^{14}). There is no true isomorphism between (I) and cubanite (cf. loc. cit.). L. S. T.

Iron sulphide in Black Sea deposits. A. D. ARCHANGELSKI (Bull. Soc. nat. Moscou, Sect. géol., 1934, 12, 431—440).—The deposits are described. CH. ABS. (e)

Structures of meteoric irons. G. DERGE and A. R. KOMMEL (Amer. J. Sci., 1937, [v], 34, 203—214).—Back-reflexion X-ray Laue photographs from

plates of kamacite from the Canon Diablo and Amelia Farm [= Bethany, South Africa] siderites suggest that [110] and [111] of kamacite are parallel to (111) and [110] of taenite (A., 1926, 1084; 1930, 1398). A good Widmanstätten pattern was produced in a Ni-Fe alloy (27% Ni) by cooling for 12 hr. from 1400°. Metallurgical evidence indicates that the Widmanstätten structure of meteorites is due to slow cooling from high temp. L. J. S.

Structure and composition of the earth's crust. P. DORN (Chem.-Ztg., 1937, 61, 713—715).—A review.

Fourteenth list of new mineral names. L. J. SPENCER (Min. Mag., 1937, 24, 601—628).—A dictionary list of 195 names collected from the lit. of the past three years. Chemical formulæ are given for each mineral, and a systematic chemical classification is appended. L. J. S.

Mesozoic bauxites of the eastern slope of the middle Urals. B. M. FEDOROV (Bull. Soc. nat. Moscou, Sect. géol., 1935, 13, 42—69).

CH. ABS. (e)
Aluminium ore. Y. ASADA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 837—850).—Mineralogical and geological studies have been made on alunite. R. S. B.

Structure and chemical composition of glauconite. P. P. PILIPENKO (Bull. Soc. nat. Moscou, Sect. géol., 1935, 13, 155—169).—Glauconite is a mixture of amorphous SiO_2 and of a cryst. material of the composition $m(2SiO_2, H_2O) + n(2R^{III}_2O_3, pR^I_2O)$, with $R^{III} = Fe, Al$, $R^I = 0.5Ca, 0.5Mg, 0.5Fe, K, Na, Li$, or H, and $p = 2-4$. CH. ABS. (e)

Bituminous series of Uresan River. N. M. STRACHOV and S. S. OSIPOV (Bull. Soc. nat. Moscou, Sect. géol., 1935, 13, 3—39). CH. ABS. (e)

Magnesium-zinc-spinels from Ceylon. B. W. ANDERSON and C. J. PAYNE (Min. Mag., 1937, 24, 547—554).—Data are given for certain blue gem spinels which show higher d and n than usual for spinel. Analysis (by M. H. HEY) of one of these gave Al_2O_3 63.21, FeO 1.93, MgO 16.78, ZnO 18.21 = 100.13, showing a transition from Mg-spinel to Zn-spinel (gahnite), and the name gahnospinel is suggested. The analysed specimen has d 3.967, n_D 1.7465; other specimens show ranges d 3.584—3.981, n_D 1.7153—1.7469. L. J. S.

Paragenesis of kyanite-amphibolites. C. E. TILLEY (Min. Mag., 1937, 24, 555—568).—Description with chemical analyses (by H. C. G. VINCENT) of these rocks from Glenelg, Scotland, and discussion of their origin by the metamorphism of an igneous rock. L. J. S.

Wollastonite solid solutions from Scawt Hill, Co. Antrim. C. E. TILLEY (Min. Mag., 1937, 24, 569—572).—Micro-sections of modified dolerite in contact with chalk show crystals of wollastonite possessing a zonal structure with variations in the optical characters. Portions with the higher vals α 1.642, γ 1.657, $2V$ 60—63° had higher d 3.11 and contained Fe, proving them to belong to the system $CaO-FeO-SiO_2$ (A., 1933, 1120). L. J. S.

"Iron-rhodonite" (from slag) and pyroxmangite and their relation to rhodonite. M. PERUTZ (Min. Mag., 1937, 24, 573—576).—Pyroxmangite from Glenelg, Scotland (this vol., 431), has a unit cell of dimensions a 7.4, b 17.1, c 6.7 Å., α 83°, β 94°, γ 113°, proving it to be distinct from rhodonite. An "iron-rhodonite" from iron slag (Whiteley and Hallimond, 1919) agrees with pyroxmangite rather than with rhodonite.

L. J. S.

Igneous rocks from the iron-producing district of Bilbao, Province of Vizcaya, North Spain. H. SERVICE (Trans. Inst. Min. Met., 1935—6, 45, 55—71).—The Bilbao Fe ore deposits occur in a Middle Cretaceous coralline limestone between mudstones, sandstones, and argillaceous limestones. The primary siderite has been formed by metasomatic replacement of CaCO_3 by Fe-bearing, carbonated hydrothermal solutions and is covered by an enriched gossan of hematite and limonite. The associated igneous rocks comprise carbonated gabbro, olivine-dolerite, camptonite, spilite, and trachyte, all of which have been subjected to hydrothermal alteration by CO_2 -rich H_2O , showing that igneous activity preceded, at least in part, metasomatism.

A. R. P.

Keratophyres of the Lahn trough. H. GÖTZ (Tsch. Min. Petr. Mitt., 1937, 49, 168—215).—24 new chemical analyses of these rocks show their variation in composition (SiO_2 55.88—73.65%). Analyses are also given of carbonates rich in Fe present in the rocks.

L. J. S.

Fields of association of some rock-forming minerals. S. R. NICKOLDS (Tsch. Min. Petr. Mitt., 1937, 49, 101—116).—Many mineral and rock analyses are plotted in a tetrahedron with CaO , MgO , total Fe as FeO , and " $+\text{Al}_2\text{O}_3$ " (i.e., not combined with alkalis in feldspar) at the corners. This shows the distribution and association of Fe-Mg minerals and anorthite.

L. J. S.

Magnesian series and the "supracrustal" rocks in the west of the Côte d'Ivoire. P. LÉGOUX (Compt. rend., 1937, 205, 158—160).—A geological description is given.

A. J. E. W.

Origin of the marcasite sink-hole deposits of Central Missouri. W. A. TARR (Amer. Min., 1937, 22, 830—841).—The mode of occurrence of the ores, the constituent minerals, and the alteration of Fe sulphides to oxides are described, and the origin of the marcasite is discussed.

L. S. T.

Occurrence of fine-grained authigenic feldspar in shales and silts. J. W. GRUNER and G. A. THIEL (Amer. Min., 1937, 22, 842—846).—X-Ray examination shows that orthoclase occurs in various shales as grains $<1 \mu$ in diameter. An analysis of a fraction of the Glenwood shale at Minneapolis is given, and the origin of the feldspar is discussed.

L. S. T.

Densities and structural relationships of kaolinites and anauxites. J. W. GRUNER (Amer. Min., 1937, 22, 855—860).—Re-determinations of d and the dimensions of the unit cells of analysed samples of four kaolinites and three anauxites (I) from different localities are recorded. The results for d do not support Hendrick's view (this vol., 383) that

the higher $\text{SiO}_2:\text{Al}_2\text{O}_3$ ratio in (I) is due to removal of Al and OH leaving a defective structure with holes. A substitution of tetrahedral SiO_4 groups for octahedral $\text{AlO}_2(\text{OH})_4$ is proposed, and the loss of OH entailed is supported by the chemical analyses. Determinations of d by centrifuging in heavy liquids can be made as accurate as those obtained with a pycnometer.

L. S. T.

Diffusion and its relation to ore deposition. S. DUFFELL (Econ. Geol., 1937, 32, 494—510).—The penetration of rocks, dry and saturated with H_2O , by aq. solutions of CuSO_4 , FeCl_3 , Na_2S , and eosin has been determined. The rocks varied from porous sandstones to a marble of low porosity. There is no marked difference between penetration of the dissolved salt into the saturated and unsaturated specimens, but with the latter, there is a separation of and more rapid penetration by the solvent, due mainly to capillary action. After this, penetration occurs by diffusion, as is the case with the saturated specimens. Similar experiments with colloidal solutions of Fe or Mo oxide, Fe^{III} ferrocyanide, Mn oxide, and silicic acid show that the dispersed phase does not penetrate the rock specimens along capillary openings to any great extent. The results are discussed in relation to ore deposition, and indicate that diffusion plays a more important rôle in the migration of solutions through rocks than is generally supposed.

L. S. T.

Geology of the Monarch and Kicking Horse ore deposits, British Columbia. E. A. GORANSON (Econ. Geol., 1937, 32, 471—493).—The deposits consist of Pb-Zn ores formed by replacement of brecciated, cryst., Cambrian dolomite. The minerals consist chiefly of hypogene sphalerite, galena, pyrite, and dolomite, with minor amounts of chalcopyrite, quartz, barite, and Ag; small amounts of As, Sb, Bi, Mn, and a trace of Au have been found in the concentrates. Supergene products include limonite, selenite, calcite, anglesite, and copiapite. The genesis of the deposits is discussed. The Pb-Zn ratios indicate that Zn was more mobile than Pb.

L. S. T.

Mount Isa ores. H. F. GRONDIJS and C. SCHOUTEN (Econ. Geol., 1937, 32, 407—450).—Results of a microscopical examination of >250 polished specimens of ores from Mt. Isa mine, Queensland, Australia, are given. The common minerals are pyrite (five varieties), sphalerite, galena, pyrrhotite, arsenopyrite, marcasite, quartz, and carbonates; several uncommon minerals, e.g., vallerite, are present. Oxidation and supergene enrichment processes and products are discussed. The mineralisation sequences are: early deposition of pyrite in the slate; crushing and faulting of the pyritic slates and deposition of the sulphides of Fe, Zn, Cu, and Pb; oxidation and supergene sulphide enrichment yielding chalcocite, covellite, anglesite, cerussite, jasper, goethite, and lepidocrocite. A syngenetic origin for the ore is excluded, and an origin by metasomatic replacement is proposed.

L. S. T.

Sulphur deposits of the Sierra de Gádor, Province of Almería, Spain. D. WILLIAMS (Trans. Inst. Min. Met., 1935—6, 45, 395—423).—The

principal deposits lie at or near the base of the Muschelkalk dolomitic limestones; within these S occurs in residual clays derived from their disintegration, as well as along bedding planes and fault fissures in the unaltered Middle Triassic rocks. Evidence is adduced to show that the S is epigenetic, being partly derived from the interaction of ascending aq. H_2S with carbonate rocks and partly from incomplete oxidation of H_2S by atm. O_2 ; simultaneously with these reactions aluminisation of the surrounding rocks occurred accompanied by pptn. of FeS_2 , gypsum, and ochres, the minerals being formed by metasomatic replacement of rock constituents. L. J. S.

Mineralogy of the Virginia diabase. A. A. PEGAU (Amer. Min., 1937, 22, 872—874).—The two chief minerals are labradorite and augite. Other minerals are enumerated, and local variations of the diabase in the no. and variety of these minerals are described. L. S. T.

Lincoln sill. J. M. TREFETHEN (J. Geol., 1937, 45, 353—380).—Chemical analyses and origin are discussed. L. S. T.

Heterogeneity of parent magma. J. S. DELURY (J. Geol., 1937, 45, 381—390).—The view that igneous rock diversity is accounted for mainly by the heterogeneity of parent magma, and that processes of differentiation play a minor and local part, is advanced. L. S. T.

Pegmatitic hornblende from the Carsphairn Complex. W. A. DEER (Geol. Mag., 1937, 74, 359—361).—The pegmatites consist of milky quartz, greenish-black hornblende, and a clove-coloured sphene. For the hornblende optical properties, a chemical analysis, and a formula are given. L. S. T.

Marginal rocks of the Cairnsmore of Carsphairn Complex. W. A. DEER (Geol. Mag., 1937, 74, 361—376).—Chemical analyses are recorded. L. S. T.

Chemical indications and physicochemical investigation of salt deposits. V. I. NIKOLAEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 479—482).—Comparison of the concn. of KCl , MgBr_2 , and H_3BO_3 in the salt waters and evaporated salts of the Ural-Emba region and the Mangischlak peninsula indicate the probability of K and B deposits, and possibly petrol, in the Mangischlak peninsula. Investigation of K and Br content of well-waters in the Kalmuck region indicates the presence of salt deposits in the latitude 46° to 47° . O. D. S.

Valentinite from the Ballao mine. A. CAVINATO (Atti R. Accad. Lincei, 1937, [vi], 25, 140—144).—Crystallographic and optical properties are recorded. O. J. W.

Emery of Samos. J. DE LAPPARENT (Tsch. Min. Petr. Mitt., 1937, 49, 1—30).—A collected account of previous papers (A., 1933, 928; 1934, 386; 1935, 1099).—Chemical analyses of the emery rock (called samosite) show that it consists largely of diaspore. L. J. S.

Chiastolite crystals. H. TERTSCH (Tsch. Min. Petr. Mitt., 1937, 49, 31—41).—The enclosed impurities marking the cross pattern are accumulated in pyramids of growth from the basal planes and

along the prism edges. Exception is taken to the idealised figure given by Dana, which would imply a hemimorphic growth. L. J. S.

Eclogite from Gilsberg, Saxony, and its metamorphism. H. HENTSCHEL (Tsch. Min. Petr. Mitt., 1937, 49, 42—88).—A petrographical description with chemical analysis of the rock is given, and its origin discussed. L. J. S.

Structural scheme of proustite and pyrrargyrite. R. HOCART (Compt. rend., 1937, 205, 68—70).—X-Ray data have been applied to the calculation of interat. distances. The most probable arrangement of the AsS_3 or SbS_3 groups and Ag atoms is similar to the arrangement of the CO_3 groups and Ca atoms in calcite. C. R. H.

Comparison of the radioactivity of Alsace rocks by the tube counter method. E. ROTHÉ and T. KORCEWICZ (Compt. rend., 1937, 205, 165—166).—The activities of a granite from Brifosse and of a rhyolite from Rosskopf have been compared with a standard Ra prep. A. J. E. W.

Substitution of SiO_4 and SO_4 groups for PO_4 groups in the apatite structure: ellestadite, the end-member. D. MCCONNELL (Amer. Min., 1937, 22, 977—986).—The series apatite-wilkeite (II)-ellestadite (I) has been investigated in terms of both end-members and two intermediate members. (I), d 3.068, a new mineral from Crestmore, Riverside Co., California, has a_0 9.53, c_0 6.91 Å. (both ± 0.01 Å.); space-group C_{2h}^{22} ; it is uniaxial, negative, with ϵ 1.650 ± 0.002 , and ω 1.655 ± 0.002 . The structural formula of (I) and, with a slight modification, of (II) is $[\text{Ca}_6(\text{F}, \text{Cl}, \text{O}, \text{OH})_2][\text{S}, \text{Si}, \text{P}, \text{C}]_4\text{O}_{16}(\text{Ca}, \text{C}_4)$, indicating that two fifths of the Ca^{++} are located on threefold axes and can be replaced by C. Three fifths of the Ca^{++} are linked to F' , Cl' , O' , or OH' , and cannot be replaced by C. All the Ca^{++} are linked to O, which are arranged in tetrahedral configurations with S, Si, P, or C at their centres. The almost complete replacement of P, one of their constituents of apatite, in (I) by S and Si without appreciable alteration of structure is significant. A chemical analysis of (I) is recorded. L. S. T.

Stauroilite area of Patrick and Henry Counties, Virginia. C. H. MOORE, jun. (Amer. Min., 1937, 22, 990—996).—Stauroilites from this area are described and illustrated. L. S. T.

Occurrence of detrital authigenic feldspar [near Mt. Morris, Michigan]. D. STEWART, jun. (Amer. Min., 1937, 22, 1000—1003). L. S. T.

Occurrence of diaspore in quartzite. E. L. BERG (Amer. Min., 1937, 22, 997—999).—Diaspore (I) is an abundant and characteristic mineral in the Sioux quartzite from several localities in S.W. Minnesota and S.-E. S. Dakota. No similar occurrence of (I) is known. L. S. T.

Woodhouseite, a new mineral of the beudantic group. D. W. LEMMON (Amer. Min., 1937, 22, 939—948).—Woodhouseite (I), $2\text{CaO} \cdot 3\text{Al}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 2\text{SO}_3 \cdot 6\text{H}_2\text{O}$, hexagonal, d 3.012, hardness 4½, uniaxial positive and also biaxial, $a:c$ 1:1.170, α $91^\circ 42'$, n 1.636, n_g (estimated)

1.638, n_z 1.647 (± 0.003), occurs in quartz veins that adjoin and penetrate the commercial andalusite deposits of White Mountain, Mono Co., California. It is readily sol. in dil. acid after the H_2O has been eliminated by heating. (I) has [A. RAUTENBERG] SiO_2 0.30, Al_2O_3 36.63, CaO 12.31, MgO 0.11, Na_2O 0.08, K_2O 0.02, H_2O + 13.25, H_2O - 0.20, P_2O_5 18.13, SrO 0.25, BaO 1.00, SO_3 17.59, total 99.87%. Sr-bearing natroalunite, d 2.90, also present in the deposits, is more abundant than (I), and has SrO 2.81%, $Na_2O : K_2O : SrO = 5 : 4 : 3$, n_z 1.608, n_w 1.587 (± 0.003). (I) is discussed in relation to other members of the alunite-beudantite group. L. S. T.

Examination of precious stones by means of their fluorescence in ultra-violet light. J. GRANT (Analyst, 1937, 62, 731).—Examples are given of differences in ultra-violet fluorescence which may be used to distinguish stones of similar appearance in daylight. E. C. S.

Naturally-occurring silver amalgams. F. HEIDE (Naturwiss., 1937, 25, 651).—The % composition and other properties of naturally occurring Ag amalgams are summarised. They all belong to either the α - or the γ -phase, no example of the β -phase having been observed. Spectroscopic analyses show that these amalgams are two-component systems only as a first approximation, other metals, e.g., Cu, Sn, Pb, and Ba, being present. Au could not be detected without preliminary concn. W. O. K.

Constitution and properties of some clay materials (bentonites and kaolin). V. PRÉVER and C. GORIA (Chim. e l'Ind., 1937, 19, 305—312).—A comparison of the chemical and physical properties of two samples of bentonite and of one of kaolin. These properties are discussed in relation to the mineral constituent of the three materials.

O. J. W.

Persistence of fluorescein in earths. Influence of ferruginous formations. A. GUILLERD and P. ÉTRILLARD (Compt. rend., 1937, 205, 77—79).—Fragments of limestone were immersed in a dil. solution of fluorescein (I) for 24 hr. The limestone was washed daily with definite quantities of H_2O of p_H 7, and the concn. of (I) in the wash- H_2O were determined. When the concn. had been reduced to 5×10^{-11} g. per c.c., the limestone was immersed in an acid solution of p_H 5.2 for 4 hr. On washing, the concn. of (I) rose to 10^{-8} g. per c.c. The flocculation of ferruginous H_2O containing (I) does not appear to reduce the concn. of (I). The results are discussed with reference to reported instances of earths retaining (I) during 2—3 years, although subject to stream action. C. R. H.

Variability in Wisconsin till and its influence on soil character. R. S. STAUFFER (Amer. J. Sci., 1937, [v], 34, 235—243).—Mechanical analyses of glacial till from which three soil types have been derived show differences in the proportion of pebbles and clay materials. L. J. S.

Turquoise deposits of Courtland, Arizona. W. P. CRAWFORD and F. JOHNSON (Econ. Geol.

1937, 32, 511—523).—Turquoise of gem quality occurs in the quartzite and the granite with limonite, kaolin, and sericite as associated minerals. Its origin is genetically related to the granite. L. S. T.

Age of the uraninite from the Ruggles mine, Grafton Centre, N.H. B. M. SHAUB (Science, 1937, 86, 156).—The calc. age is 302×10^6 years. The hand-picked material, d 7.02, has [F. HECHT] Pb 3.37, Th 0.38, U 76.38, and S 0.04%. L. S. T.

Mica in argillaceous sediments. R. E. GRIM, R. H. BRAY, and W. F. BRADLEY (Amer. Min., 1937, 22, 813—829).—Illite is the general term proposed for the clay mineral constituent of argillaceous sediments belonging to the mica group. This constituent can now be separated in a relatively pure state as colloidal fractions from shales, clays, etc., by means of the supercentrifuge fractionation technique. Optical properties, X-ray data, and chemical analyses of purified samples from several localities in Illinois are recorded and discussed. The purest samples indicate a composition $2K_2O, 3MO, 8R_2O_3, 24SiO_2, 12H_2O$, where M is Fe^{++} or Mg. Dehydration curves of muscovite and illite are compared, and base-exchange data for illite are recorded. Illite is somewhat similar to muscovite in many respects, but is closest in composition to the phengite variety of mica. Relationships to other micas are discussed, and chemical analyses of micas resembling illite are tabulated for comparison.

L. S. T.

Sediments of gyttja at Gipka. P. NOMALS (Acta Univ. Latviensis, Lauk. Fak. Ser. 1, 1930, 65—79).—The newly-discovered deposit is described. Destructive distillation at 400—450° gave a very volatile, brown oil (30—32 kg. per cu. m. of naturally wet gyttja). Air-dried gyttja can be used as a low-grade fuel. CH. ABS. (e)

Origin of petroleum. C. D. NENITZESCU (J. Inst. Petroleum Tech., 1937, 23, 469—482).—Relevant theories are surveyed and experimental facts and observations summarised. C. C.

Origin of coal, asphalt, and petroleum. E. BERL (Österr. Chem.-Ztg., 1937, 40, 385—387).—All natural fuels are derived from plant materials, fusain and brown coals from lignin, bituminous coals, asphalt, and petroleum principally from cellulose and other carbohydrates. The course of the transformation has been determined by the geological conditions, particularly by the acidity or alkalinity of the surrounding medium. Petroleum has been derived from asphalt (and not *vice versa* as is often assumed) by cracking and hydrogenation. A. B. M.

Barzas coals. G. L. STADNIKOV, V. G. PUTZILLO, and L. N. BAKUSCHINSKAJA (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 387—396).—Comparison of analytical data for *Laminaria digitata* and *japonica* and for *Fucus vesiculosus* with those for Barzas coal shows that of the constituents of the plants only lignin has survived. It is concluded that plant carbohydrates and pectins did not play any part in the production of petroleum. R. T.

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

DECEMBER, 1937.

Spectrum of doubly excited helium. F. P. BUNDY (Physical Rev., 1937, [ii], 52, 452—453; cf. Kiang, A., 1936, 1437).—Attempts with a special electron-impact discharge tube, giving a conc. 1000 ma. beam of 300—500 v. electrons through purified He at approx. 0.01 mm. Hg, to observe the spectrum of doubly excited He gave negative results. Experimental and theoretical implications are discussed. N. M. B.

Excitation and ionisation in active nitrogen. G. CARIO and U. STILLE (Z. Physik, 1937, 107, 396—408).—N afterglow spectra photographed from sealed discharge tubes show no negative bands or higher members of the first positive group. It is suggested that Kaplan's observation of these in such spectra (A., 1935, 907) is due to excitation of long-lived mol. ions resulting from the discharge. Conditions for the excitation, and an estimate of the life period of such ions, are given. L. G. G.

Relative intensities and transition probabilities of the orange neon lines. M. GARBUNY (Z. Physik, 1937, 107, 362—368).—From measurements on the positive column Ne glow, conclusions are drawn as to the relative transition probabilities. L. G. G.

Stark effect with magnesium lines. H. ECKARTH (Z. Physik, 1937, 107, 182—191).—A method for observation of the Stark effect with fields up to 690 kv. per cm. is described. The Mg II line, λ 4481, and several members of the sharp and diffuse subordinate series in the triplet system, are influenced by the electric field. A limit for the existence of the excited state is shown by individual terms of the diffuse singlet and triplet subordinate series. H. C. G.

***g* Factors of rare gas terms.** K. LORINCZI (Z. Physik, 1937, 107, 177—179).—The discrepancy between the observed Zeeman effect and the *g* formula for the p^5p configuration as given in the literature is due to an error in calculation. After correction, reasonable agreement is found for numerous A, Kr, and Xe terms. H. C. G.

Extreme ultra-violet spectra of scandium VI and scandium VII and other elements isoelectronic with phosphorus I and sulphur I. P. G. KRUGER and H. S. PATTIN (Physical Rev., 1937, [ii], 52, 621—625; cf. A., 1937, I, 485).—The spectra of Sc, Ti, V, and Cr were photographed in the range 80—700 Å. with a large grazing incidence vac. spectrograph. Ion multiplets are identified with the aid of the irregular doublet law and const. second difference law. In the S I sequence, multiplet

data and calc. term vals. obtained through the identification of intercombination lines are given; in the P I sequence multiplet data only were obtained.

N. M. B.

Band spectrum of As₂. G. D. KINZER and G. M. ALMY (Physical Rev., 1936, [ii], 49, 880; cf. A., 1936, 1039).—This spectrum has been extended to 7000 Å. Two new systems of bands, *D* and *E*, have been observed. L. S. T.

Emission and absorption band spectra of selenium. R. K. ASUNDI and Y. P. PARTI (Proc. Indian Acad. Sci., 1937, 6, A, 207—228; cf. A., 1930, 1075; 1936, 654).— $\lambda\lambda$ and intensities of emission bands in the range 3800—5875 Å. are tabulated; the bands show very irregular spacing of the vibrational levels. The energy of dissociation of the ground state is 2.7 ± 0.2 e.v. The observed bands are classified on the basis of two systems having a common initial level which is probably $^3\Sigma^-$; the ground level is $^3\Sigma^-$, the third level possibly being a singlet level due to unexcited atoms, and analogous to $^1\Sigma^+$ in O₂. The absorption bands reported by Moraczewska (A., 1930, 830) are probably due to SeO₂.

A. J. E. W.

Ground state of the Se₂ molecule. S. S. BHATNAGAR, H. LESSHEIM, and M. L. KHANNA (Proc. Indian Acad. Sci., 1937, 6, A, 155—157).—A detailed account of work already noted (A., 1937, I, 504).

Nuclear spin of rhodium. L. SIBAIYA (Proc. Indian Acad. Sci., 1937, 6, A, 229—231).—Measurements of the hyperfine structure of the Rh spectrum at 3434.9 Å. indicate that the nuclear spin of ¹⁰³Rh is $\frac{1}{2}$, the atom possessing a small positive magnetic moment. A. J. E. W.

Spark spectra of iodine in the extreme ultra-violet. L. BLOCH, E. BLOCH, and N. FELICI (J. Phys. Radium, 1937, [vii], 8, 355—362; cf. A., 1935, 271; 1936, 916).— $\lambda\lambda$ and intensities of 445 lines in the range 1000—190 Å. are recorded. Three groups of lines are observed, these probably corresponding with I II, I III, and I IV—I VII, respectively. The two fundamental lines $^1S_0 - ^1P_1$ and $^1S_0 - ^3D_1$ of I VIII have been observed, completing the isoelectronic series Pd I . . . Te VII, I VIII. 12 new lines attributed to I II are in accord with Lacroute's classification.

A. J. E. W.

Third spectrum of cerium (Ce III). H. N. RUSSELL, R. B. KING, and R. J. LANG (Physical Rev., 1937, [ii], 52, 456—466).—Data and identifications for 33 triplet and singlet terms involving 294

lines, mainly of $\lambda > 2000$ Å., are tabulated and discussed. N. M. B.

Spectrum of neutral samarium, Sm I. W. ALBERTSON (Physical Rev., 1937, [ii], 52, 644—647; cf. A., 1935, 556).—Newly identified terms and energy states are given and data and classifications of lines are tabulated. The approx. ionisation potential of Sm I is 5.6 v. N. M. B.

Stepwise fluorescence in mercury-nitrogen mixtures. 3650 line. L. A. TURNER (Physical Rev., 1937, [ii], 52, 632—637).—A series of experiments by Wood and Gaviola showed that when Hg vapour is illuminated by light from a Hg arc and N₂ is added in increasing amounts the concn. of atoms in the ³P₂ state, as shown by intensity changes in λ 3650, passes through a min. An explanation involving excitation of atoms in the ³P₁ state by vibrating N₂ mols. is discussed. The results obtained when a filter of Br vapour is used indicate a transfer of excited Hg atoms from one to another ³D state on collision with N₂. N. M. B.

Light yield in the electron impact glow of thallium vapour. G. STROHMEIER (Z. Physik., 1937, 107, 409—413).—Apparatus for electron impact in Tl vapour is described, and from the resulting spectra excitation functions are derived. It is shown, contrary to all similar work, that the ground state whence the excitation proceeds corresponds with a *P* term and not an *S* term. L. G. G.

Excitation and emission of limits of the atomic continuous spectra. H. BARTELS (Z. Physik., 1937, 107, 424).—A correction to earlier work (A., 1937, I, 386). L. G. G.

Faraday effect near isolated band lines. T. CARROLL (Physical Rev., 1936, [ii], 49, 887). L. S. T.

Diffraction pattern due to an absorbing prism. R. C. SPENCER (J. Opt. Soc. Amer., 1937, 27, 318—322).—Mathematical. An equation is derived to take account of the transition of Fraunhofer bands with zero to infinite absorption by the prism. The resolving power of an absorbing prism and application to X-rays are considered. N. M. B.

Equivalent electrons and their spectroscopic terms. C. L. B. SHUDEMAN (J. Franklin Inst., 1937, 224, 501—518).—A simpler method than that of Russell (A., 1927, 705) for the calculation of spectral terms which arise from combinations of equiv. electrons, and capable of yielding the more complicated results for equiv. *g*, *h*, and *i* electrons, is given. A. J. M.

Monochromatic solar observations in the light of the helium line 5876. M. WALDMEIER (Naturwiss., 1937, 25, 715).—Observations, with the spectrohelioscope, with the He 5876 line show bright spots, and two types of dark spots, one without, the other with, the Doppler effect. Comparison is made with the H_α spectroheliogram. A. J. M.

Monochromatic images of the sun obtained on the spectroheliograph with the infra-red helium line λ 10,830, the violet line H_ε of hydrogen, and the infra-red lines λ 10,938 and λ 10,049 of the

same element. L. D'AZAMBUJA and (MME.) L. D'AZAMBUJA (Compt. rend., 1937, 205, 554—556).—The spectroheliograms are described and discussed and the origin of the lines is considered. A. J. E. W.

Solar radiation between 2000 and 3000 Å. K. O. KIEPENHEUER (Naturwiss., 1937, 25, 669).—In contradiction to previous observations (Meyer *et al.*, Nature, 1934, 134, 535) no radiation between 2000 and 2800 Å. could be detected on the summit of the Jungfrau in July and August. The shortest detectable λ of solar radiation is approx. 2845 Å. A. J. M.

Shape of the Compton line for helium and molecular hydrogen. B. HICKS (Physical Rev., 1937, [ii], 52, 436—442).—Mathematical. By using variation functions which take into consideration the instantaneous interaction of the electrons, momentum distribution functions and intensity distributions in the Compton lines are computed for He and H₂, neglecting small relativity and binding corrections. N. M. B.

Direct spectrum of the structure and shift of the Compton line with helium gas as the scatterer. J. W. M. DU MOND and H. A. KIRKPATRICK (Physical Rev., 1937, [ii], 52, 419—436).—The characteristic *K* lines from a Mo target X-ray tube were scattered almost directly backwards by He at 14 atm., and the scattered radiation was resolved with a Cauchois focussing curved quartz-crystal spectrograph on a curved photographic film after 2059 hr. exposure. The structure and breadth of the modified line of this, the first direct spectrum obtained of radiation scattered by a gas, are in good agreement with the predictions of Du Mond's theory regarding the modified line as broadened by the Doppler effect of the momentum of the electrons in the scatterer. The slight defect in the shift (cf. Ross, A., 1934, 1282) caused by the momentum imparted to the atom in the ejection of the recoil electron is verified. Previous investigations on the structure and shift of modified scattered radiation are critically reviewed. N. M. B.

Variation of the atomic structure factor of nickel with X-ray wave-length. W. P. JESSE (Physical Rev., 1937, [ii], 52, 443—451; cf. A., 1936, 655).—X-Ray measurements made with a vac. ionisation spectrometer on powdered Ni to determine the variation of the at. structure factor in the region of the *K* absorption edge, $\lambda = 1.4839$ Å., over the range 0.560—2.74 Å., using powdered NaCl and LiF as comparison substances, show that the experimental dispersion curve for the at. structure factor, based on the difference between measured structure factor vals. on the long and short λ side of the *K* absorption edge, does not agree in shape with the theoretical curve, except approx. at longer λ . N. M. B.

Electronic specific heat and X-ray absorption of metals, and some other properties related to electron bands. H. JONES and N. F. MOTT (Proc. Roy. Soc., 1937, A, 162, 49—62).—A theoretical investigation for metals having closed *d* shells shows that the linear term in the expression for electronic sp. heat is $>$ that given by the free electron theory.

The high sp. heat of Ni, Pd, Pt, and Ta is attributed to an incomplete d shell. The density of states in the d band is calc. and magnetic susceptibilities, high-temp. resistance, and thermoelectric power for body-centred cubic transition metals are discussed. The fine structure of long- λ X-ray absorption bands is considered.

G. D. P.

Ionisation potentials of H_2 , N_2 , CH_4 , and H_2O . L. G. SMITH and W. BLEAKNEY (Physical Rev., 1936, [ii], 49, 883).—Mass-spectrographic measurements of the min. energies of electrons to produce ions of H_2^+ , N_2^+ , and H_2O^+ give the vals. 15.37, 15.57, and 12.59 v. (all ± 0.05 v.), respectively. In CH_4 , ions of H_3^+ are formed in addition to those of CH_4^+ , CH_3^+ , CH_2^+ , CH^+ , C^+ , H^+ , and H_2^+ . The ionisation potential of CH_4^+ is 12.72 v., and the appearance potentials of H^+ , H_2^+ , and H_3^+ are 22.7, 27.8, and 26.0 v., respectively.

L. S. T.

Effect of temperature on photo-electric emission. R. J. CASHMAN (Physical Rev., 1937, [ii], 52, 512—518).—Mathematical. From a survey of existing theories and data it is concluded that experimental results can be fitted to a T^2 law provided v_0 is regarded as a function of temp., and this leads to an accurate method of determining the temp. coeff. of v_0 giving good agreement with thermionic data.

N. M. B.

Detection of glow emission of single electrons by means of a proportional double amplifying device. E. H. WINKLER (Z. Physik, 1937, 107, 235—250).—By means of a two-stage potential drop amplifier and electrometer, the commencement and temp.-dependence of electron emission from Pt wire was measured. With an "amplification factor" of 200,000 and an electrometer sensitivity of 50,000 electrons per sq. mm., single electron emission may be detected. Commencement of electron emission at 509° from Pt wire 0.1 mm. thick occurs with a current of 3.88×10^{-20} amp. per sq. cm. and the emission potential for Pt is 4.3 v. Richardson's law is confirmed in the region of single electrons.

L. G. G.

Diamagnetism of an electron gas. A. PAPAPETROU (Z. Physik, 1937, 107, 387—392).—Conclusions drawn from earlier work (A., 1937, I, 404) are incorrect. The magnetic behaviour of an electron gas in weak fields remains normal.

L. G. G.

Fluctuation phenomena in the passage of high-energy electrons through lead. W. H. FURRY (Physical Rev., 1937, [ii], 52, 569—581).—Mathematical. The fluctuations in size of showers produced by single electrons or photons and the fluctuations in energy loss of electrons are considered.

N. M. B.

Visual observations on the Malter effect. L. R. KOLLER and R. P. JOHNSON (Physical Rev., 1937, [ii], 52, 519—523).—The thin film field emission (cf. Malter, A., 1936, 540) from Al_2O_3 films on Al was investigated by coating the film with fine willemite dust and observing the behaviour of the primary beam, and by forming an electron image of the surface by means of the Malter current from it. The behaviour of the films while exhibiting the Malter effect is described and discussed.

N. M. B.

Calculation of the penetration of electrons of a few million volts. I. S. FRANCHETTI (Atti R. Accad. Lincei, 1937, [vi], 25, 468—474).—Theoretical.

O. J. W.

Secondary production of electrons in the corona discharge at low pressures. W. CHRISTOPH (Ann. Physik, 1937, [v], 30, 446—466).—Photo-electric measurements of the light emitted by a corona discharge in H_2 and air show that the no. of emitted quanta \propto the ratio of the current and the gas pressure. Direct measurements of the ionisation produced by this light have been made by means of a counter tube. For H_2 and air at 50 mm. pressure the photo-current produced by light from the discharge is, at a min. estimate, 1% of the total current. Allowing for the increase by collision, it is calc. that 50% of the total current has its origin in photoionisation. Mean absorption coeffs. for the emitted light for H_2 and air at 760 mm. are 27.6 cm.^{-1} and 53.5 cm.^{-1} , respectively. A method of measuring the frequency of discharges in the counting tube up to 2.5×10^3 per sec. is described; it depends on the measurement of the time interval between application of the potential and establishment of the discharge.

O. D. S.

Angular distribution of photo-electrons from the K shell. F. F. H. EGGLESTON and L. H. MARTIN (Proc. Roy. Soc., 1937, A, 162, 95—110).—The angular distribution of X-ray photo-electrons from the K shell of A is studied by means of the Wilson expansion chamber. The distribution curves, bipartition angles, and asymmetries of electrons with energies of 14.2, 46.8, and 88.2 e.k.v. are in agreement with the predictions of wave mechanics.

G. D. P.

Dimension relations for electron motion in alternating fields. II. E. BRUCHE and A. RECKNAGEL (Z. tech. Physik, 1937, 18, 139—140; cf. *ibid.*, 1936, 17, 241).

O. D. S.

Ionisation of mercury vapour by positive potassium ions. R. N. VARNEY, M. E. GARDNER, and A. C. COLE (Physical Rev., 1937, [ii], 52, 526—527).—Using a balanced space charge method of improved sensitivity for detecting ionisation (cf. A., 1935, 556), no ionisation of Hg vapour by K ions of energies up to 300 e.v. was detected, although ionisation by Na ions has been found (cf. A., 1936, 1171).

N. M. B.

Mass-spectrographic examination of nitrogen hydrides. K. SCHÄFER and R. CONRAD (Z. Physik, 1937, 107, 393—395).—Ions produced in canal-ray tubes in NH_3 , N_2H_4 , and mixtures of $N_2 + H_2$ were examined by the parabola method. Normal exposure times show the presence of N^+ ($m = 14$), NH^+ and NH^- ($m = 15$), NH_2^+ and NH_2^- ($m = 16$), NH_3^+ ($m = 17$), and N_2^+ ($m = 28$). Strong overexposure reveals lines of $m = 18, 29$, and 30 . These and the non-appearance of negative ions ($m = 14, 17$, and 28) are variously explained. Results are in accord with those of Taylor (A., 1935, 801).

L. G. G.

Negative atomic hydrogen and deuterium ions. P. F. DARBY and W. H. BENNETT (Physical Rev., 1936, [ii], 49, 881—882).—The source of negative at. H ions previously reported (A., 1936, 263) has been improved and simplified by the introduction of Hg

vapour and the use of a transverse magnetic field. Using 50% D₂O, only 0.6 as much negative D as negative H was obtained.

L. S. T.

Destruction of electron space charges by positive ion rays. R. KIENZLE (Ann. Physik, 1937, [v], 30, 401—419).—The destruction of a negative space charge by a directed beam of positive ions of velocity from 100 to 1250 v. has been investigated. The effect increases with increasing space charge density and with increasing ion velocity. With increasing no. of positive ions the effect increases to a saturation val. determined by the original val. of the space charge. The influence of the direction of the ionic beam has been investigated. Results indicate that the effect is, at least in part, due to the change in the potential distribution by the presence of the positive ions. Kingdon's theory (Physical Rev., 1923, 21, 408) is not applicable to positive ions of the high velocities used.

O. D. S.

Velocity analysis by means of the Stern-Gerlach effect. V. W. COHEN and A. ELLETT (Physical Rev., 1937, [ii], 52, 502—508).—A method permitting a study of the velocity distribution in a mol. beam and of the behaviour of the field gradient as a function of position is applied to a beam of alkali atoms and shows that with low v.p. in the oven the Maxwell distribution law is obeyed, but at oven pressures such that the mean free path is the width of the oven slit a departure sets in.

N. M. B.

Velocity analysis of potassium atoms scattered by magnesium oxide. A. ELLETT and V. W. COHEN (Physical Rev., 1937, [ii], 52, 509—512).—A beam of K atoms was scattered by a MgO crystal and the magnetic velocity analyser (cf. preceding abstract) was used to determine the velocity distribution of the scattered atoms. The velocity spectrum agrees with that calc. from a Maxwell distribution characteristic of the crystal for a crystal temp. varied over a wide range. There is no evidence of specular reflexion or of diffraction but only of random or cosine scattering. The process appears to be one of adsorption and re-evaporation.

N. M. B.

Magnetic moment of the proton. I. ESTERMANN, O. C. SIMPSON, and O. STERN (Physical Rev., 1937, [ii], 52, 535—545).—The magnetic moment of the proton, measured by the method of magnetic deflexion of mol. beams employing H₂ and HD, was 2.46 nuclear magnetons, accurate to $\pm 3\%$.

N. M. B.

At. wt. of phosphorus. O. HONIGSCHMID (Naturwiss., 1937, 25, 670—671).—Nephelometric determination of the ratio POCl₃:3Ag gives 30.978 for the at. wt. of P, in agreement with the mass-spectrographic val.

A. J. M.

At. wt. of neodymium. O. HONIGSCHMID (Naturwiss., 1937, 25, 701).—Analysis of NdCl₃ gives the val. 144.27 for the at. wt. of Nd, in exact agreement with the International val., and disagreeing with Aston's mass-spectrographic val. of 143.5.

A. J. M.

Abundance ratio of the isotopes in natural or isotopically separated carbon. A. R. BROSI and

W. D. HARKINS (Physical Rev., 1937, [ii], 52, 472—474).—The relative intensity of the (1, 0) band heads of the ¹²C¹²C and ¹²C¹³C mols. in the Swan system of the C₂ spectrum, measured by a photographic spectrophotometric method, is 0.0217 ± 0.0009 , giving a val. of 92.2 ± 3.7 for the ¹²C/¹³C abundance ratio in good agreement with the val. 91.6 ± 2.2 obtained from mass-spectrographic data (cf. Vaughan, A., 1936, 400).

N. M. B.

The row of increasing at. wts. and the periodic law. A. V. GROSSE (J. Chem. Educ., 1937, 14, 433—444).—The arithmetic mean of the at. wts. of all at. species of an element is used instead of the at. wt. for the exact formulation of the periodic law. The anomalies associated with A, Co, Te, and Th then disappear.

L. S. T.

Second report of the Committee on Atoms of the International Union of Chemistry. F. W. ASTON, N. BOHR, O. HAHN, W. D. HARKINS, and G. URBAIN (Paris, 1937, 19 pp.).—The International Table of stable isotopes has been revised for the 1937 edition as a result of data taken from nine papers.

Tritium or triterium? K. C. BAILEY (Nature, 1937, 140, 590).—The name that corresponds with deuterium is "tritium." "Triterium" should not be used.

L. S. T.

Distribution of the lifetimes of radioelements. M. E. NAHMIAS (Physical Rev., 1937, [ii], 52, 666; cf. A., 1937, I, 340).—Plottings of additional data support a Gaussian-like distribution of lifetimes, and results, examined mathematically, confirm this view.

N. M. B.

Fourth radioactive family with at. wts. $4n + 1$. L. GROSCHEV (Uspech. Fiz. Nauk. U.S.S.R., 1935, 15, 931—932).—A review.

CH. ABS. (e)

Present position (June 1, 1937) of the theory of β -decay. G. GAMOW (Physikal. Z., 1937, 38, 800—814).—A review.

Compton effect with γ -rays. R. S. SHANKLAND (Physical Rev., 1937, [ii], 52, 414—418).—Results of investigations of the Compton effect using Geiger-Müller counters are summarised. No time lag as great as 10^{-4} sec. can exist in the Compton scattering process. The angular relationship given by the photon theory is verified to within $\pm 20^\circ$.

N. M. B.

γ -Radiation from lithium and fluorine bombarded with protons. E. R. GAERTTNER and H. R. CRANE (Physical Rev., 1937, [ii], 52, 582—591; cf. A., 1937, I, 108).—In view of disagreement between the results given by recoil electrons and pairs, the recoil electrons ejected from a 2-mm. C scatterer by the γ -radiation from Li + ¹H were investigated and indicate lines of energies 17, 14.5, 11.5 and possibly 8.5 m.e.v. Pairs ejected from the same scatterer are attributed mainly to the 17 m.e.v. line. Recoil electrons ejected from a 1.5-mm. C scatterer by the γ -radiation from F + ¹H indicate lines of energies 5.7 and 4 m.e.v. Pairs produced by internal conversion of the same radiation indicate the same two lines. The cross-section for this effect is in good agreement with theory.

N. M. B.

Emission of electrons from substances of varying thickness and atomic number by means of hard γ -rays. E. CARLSEN (*Naturwiss.*, 1937, **25**, 700—701).—Repetition of earlier work (Workman, A., 1933, 762; Gueben *et al.*, *ibid.*, 762) shows that it was partly invalidated by the natural activity of the walls of the ionisation chamber. γ -Rays from Ra were filtered through 12 mm. and 50 mm. of Pb, respectively, and Al, Cu, Sn, and Pb were used as secondary filters. For equiv. metal thicknesses the absorption is approx. the same in Cu, Sn, and Pb, but is smaller for the hard than for the soft γ -rays. Al absorbed in both cases more strongly than the other metals. The max. of the absorption curves are smaller for hard γ -rays than for soft, the more so the greater is the at. no. A. J. M.

Resonance levels of the two ^{80}Br isomerides. R. FLEISCHMANN (*Z. Physik*, 1937, **107**, 205—209).—The energies of the resonance neutrons produced from the isomeric nuclei ^{80}Br ($t = 18$ min.) and ^{80}Br ($t = 4.2$ hr.) have been measured by absorption in B and found to be identical within limits of experimental error. H. C. G.

Scattering of slow neutrons. M. GOLDBABER and G. H. BRIGGS (*Proc. Roy. Soc.*, 1937, **A**, **162**, 127—143).—Improved methods for measuring total and scattering cross-sections of the elements are described. Total cross-sections for a few and scattering cross-sections for most of the elements are tabulated. The scattering of slow neutrons by H in H_2O or paraffin mols. is the same. Elements heavier than H do not slow down medium-velocity neutrons appreciably. An upper limit, 10^{-27} cm., is given for the cross-section for scattering of slow neutrons by electrons. G. D. P.

Low-temperature neutrons. W. F. LIBBY and E. A. LONG (*Physical Rev.*, 1937, [ii], **52**, 592—603; cf. A., 1936, 1314).—Experiments are described which indicate that hydrogenous substances (paraffin, $n\text{-C}_7\text{H}_{16}$, C_2H_6 , CH_4 , H_2O , NH_3 , and H_2) so cold that nearly all the mols. are in the ground state can cool only those neutrons having kinetic energies great enough to excite the mols. to their first state, the probability of energy loss to a liquid or crystal is small, and, for hydrocarbons, the limiting temp. for cooling neutrons decreases with increase in length of the hydrocarbon chain. A neutron thermometer, using the absorption by B, was tested and approx. calibrated. N. M. B.

Inelastic scattering of fast neutrons. G. T. SEABORG, G. E. GIBSON, and D. C. GRAHAME (*Physical Rev.*, 1937, [ii], **52**, 408—414).—Evidence is presented that the soft γ -rays produced when fast neutrons bombard various substances are due to a process of inelastic scattering. Measurements on absorption, inelastic scattering, and slowing of fast neutrons in C, Al, S, CCl_4 , Fe, Cu, Cd, and Pb are given. N. M. B.

Disintegration of boron by deuterons. W. E. STEPHENS and T. W. BONNER (*Physical Rev.*, 1937, [ii], **52**, 527).—The presence of 13-m.v. neutrons when B is bombarded with 0.9-m.v. deuterons in He is

confirmed (cf. A., 1936, 1174), indicating that 13-m.v. neutrons do make elastic collisions with He nuclei.

N. M. B.

Addition processes with fast protons. W. GENTNER (*Z. Physik*, 1937, **107**, 354—361).—From coincidence measurements on secondary electrons from γ -rays produced by the bombardment of Li, B, F, Na, and Al with protons up to 600 e.k.v. energy, the quantum energies and positions of resonance of the γ -rays are obtained. The mechanism of proton addition is discussed. L. G. G.

Disintegration of lithium by deuterons. J. H. WILLIAMS, W. G. SHEPHERD, and R. O. HAXBY (*Physical Rev.*, 1937, [ii], **52**, 390—396; cf. Rumbaugh, A., 1937, I, 5).—The disintegrations studied in the deuteron energy range 100—250 kv. were: (1) $^7\text{Li} + ^2\text{H} \rightarrow ^4\text{He} + ^3\text{He} + Q_1$, (2) $^6\text{Li} + ^2\text{H} \rightarrow ^4\text{He} + ^3\text{He} + Q_2$, (3a) $^6\text{Li} + ^2\text{H} \rightarrow ^3\text{Li} + ^3\text{H} + Q_{3a}$, (3b) $^6\text{Li} + ^2\text{H} \rightarrow ^7\text{Li} + ^1\text{H} + Q_{3b}$; $^7\text{Li} \rightarrow ^3\text{Li} + h\nu$, (4) $^7\text{Li} + ^2\text{H} \rightarrow ^4\text{He} + ^4\text{He} + Q_4$. Efficiency curves for (1), (2), and (3a) are regular. The Oppenheimer-Phillips process (cf. A., 1935, 1296) is not applicable to (3a). The relative yield of (3b) to (3a) rises with increasing deuteron energy. The return of the excited Li nucleus in (3b) to its normal state is shown by the emission of a γ -ray of 400 kv. energy as determined by absorption measurements. The existence of a homogeneous group of particles from (4) indicates the instability of ^5He , which has a mean life of approx. 6×10^{-20} sec., and is unstable by 0.93 m.e.v., disintegrating into an α -particle and a neutron. Abs. yields for the five disintegrations are given for a deuteron energy of 212 kv. N. M. B.

β -Ray spectra of ^8Li and ^{12}B . D. S. BAYLEY and H. R. CRANE (*Physical Rev.*, 1937, [ii], **52**, 604—609).—The use of strict criteria in track selection leads to the val. 12.0 ± 0.6 m.e.v. for the upper limits of both spectra. There is evidence that the protons emitted during the formation of ^8Li have nearly zero energy, and at least 1 m.e.v. in the case of ^{12}B . Comparisons of results with those predicted by the Konopinski-Uhlenbeck and Fermi theories in conjunction with α -particle distribution data are discussed. N. M. B.

Long period positron activity: ^{22}Na . L. J. LASLETT (*Physical Rev.*, 1937, [ii], **52**, 529—530).—Bombardment of Mg with 5.2-m.e.v. deuterons gave rise to a long-period radioactivity ascribed to ^{22}Na (half-life 3.0 ± 0.2 years). Absorption measurements on the positrons emitted agree with those for F under α -particle bombardment. The positron momentum distribution investigated with a H_2 -filled cloud-chamber in a magnetic field gave an upper limit corresponding with 0.58 ± 0.03 m.e.v. N. M. B.

New radioactive isotope of potassium. H. WALKER (*Physical Rev.*, 1937, [ii], **52**, 663; cf. A., 1937, I, 213).—Pure Ca or $\text{Ca}(\text{OH})_2$ irradiated with high-energy neutrons from a Li target bombarded with 14 ma. deuterons gave activities of half-life 12.5 hr. and 18 ± 1 min., chemically identified as K isotopes and attributed to ^{42}K (12.5 hr.) and to $^{43,44}\text{K}$ (18 min.) formed thus: $^{43,44}\text{Ca} + n^1 \rightarrow ^{43,44}\text{K}$; $^{43,44}\text{K} \rightarrow ^{43,44}\text{Ca} + e^-$. N. M. B.

β -Ray spectrum of ^{56}Mn . R. H. BACON, E. N. GRISEWOOD, and C. W. VAN DER MERWE (Physical Rev., 1937, [ii], 52, 668).—Measurements of the β -ray spectrum of ^{56}Mn excited by bombarding NaMnO_4 solution with neutrons from a Ra-Be source confirm the results of Brown (cf. A., 1936, 1441) rather than those of Gaerttner (cf. *ibid.*, 918).

N. M. B.

Radioactive isotopes of indium. L. J. LAWSON and J. M. CORK (Physical Rev., 1937, [ii], 52, 531—535).—Assignments of the seven radioactive periods known to exist were established by bombarding In with slow neutrons, deuterons, and very fast neutrons, and by bombarding Cd with deuterons. Assignments are: ^{116}In (54 min. and 13 sec.), ^{114}In (4.1 hr. and 50 days), ^{111}In (20 min.), ^{112}In (72 sec.), ^{117}In (2.3 hr.). β -Ray energy limits are approx. 2.15 m.e.v. for the 50-day period and 1.75 m.e.v. for the 20-min. positive period.

N. M. B.

Detection of α -particles in the disintegration of thorium. A. BRAUN, P. PREISWERK, and P. SCHERRER (Nature, 1937, 140, 682).—Bombardment of Th by neutrons from a Ra-Be source gives α -particles of energy $>9 \times 10^6$ e.v. They are ascribed to the change $^{232}\text{Th} \rightarrow ^{228}\text{Ra}$.

L. S. T.

Nuclear transformations produced in copper by α -particle bombardment. W. B. MANN (Physical Rev., 1937, [ii], 52, 405—407).—Bombardment of Cu by 11-m.e.v. α -particles gives rise to activities of half-life 1.10 ± 0.05 and 9.2 ± 0.2 hr., belonging, respectively, to ^{68}Ga and ^{66}Ga , both positron active. Absorption measurements gave vals. of 1.8 and 3.1 m.e.v., respectively, for the max. energies of the short- and long-period positrons, but measurements of the positron tracks photographed in a cloud-chamber gave corresponding vals. of 1.9 and 3.9 m.e.v. The excitation function for α -particles and Cu was investigated.

N. M. B.

Radioactive isotopes of scandium from calcium and potassium by α -particle bombardment. H. WÄLKE (Physical Rev., 1937, [ii], 52, 400—404; cf. A., 1937, I, 213).— ^{43}Sc was separated chemically from Ca; the half-life is 4.0 ± 0.1 hr. There was no evidence of ^{46}Sc or ^{47}Sc . ^{42}Sc (4.1 ± 0.1 hr.) and ^{44}Sc (52 ± 3 hr.) were isolated from K. Decay curves are given. Cloud-chamber studies of the positrons emitted by ^{43}Sc and ^{42}Sc show that the upper limits of the two spectra are 1.3(8) and 1.6(3) m.e.v., respectively.

N. M. B.

Absorption of high-energy electrons. II. J. J. TURIN and H. R. CRANE (Physical Rev., 1937, [iii], 52, 610—613; cf. A., 1937, I, 487).—Cloud-chamber measurements of the energy loss of electrons in passing through Pb and C absorbers are extended up to 11 m.e.v. by using β -rays from ^8Li . The vals. of the average energy loss for Pb are $>50\%$ $>$ those predicted by the Bethe-Heitler theory; this discrepancy is discussed and partly explained to increase agreement to within 30%. Results for C are in good agreement with theory.

N. M. B.

Transmutations with possible emission of negative protons. M. E. NAHMIAS (Physical Rev., 1937, [ii], 52, 525; cf. A., 1937, I, 340).—Attempts

to detect ^{11}C and ^{27}Si (radio elements the existence of which would support the possibility of a negative proton) after bombardment of B and Al with fast neutrons were unsuccessful.

N. M. B.

Variations of cosmic ray intensity during magnetic storms. C. SRÖRMER (Nature, 1937, 140, 549—550).—The interrelationship observed (A., 1937, I, 546) was predicted by the author.

L. S. T.

Ultra-radiation and active solar processes. J. ZIRKLER (Naturwiss., 1937, 25, 715).—Increase in the intensity of ultra-radiation was observed when H_2 eruptions occurred on the sun, and when sun-spots passed through the central meridian of the sun.

A. J. M.

Electrodynamical force equation in its bearing on evidence for the existence of a new cosmic-ray particle. W. F. G. SWANN (Physical Rev., 1937, [ii], 52, 387—390).—Mathematical.

N. M. B.

Cosmic-ray measurements with a small ionisation chamber. I. Variation with altitude and latitude of the total ionisation for various shields. R. T. YOUNG, jun., and J. C. STREET. II. Comparison of small bursts at different altitudes and their variations with thickness of shield. R. T. YOUNG, jun. (Physical Rev., 1937, [ii], 52, 552—559, 559—564).—I. Latitude ionisation ratios, northern: equatorial, for shielding thicknesses up to 19.4 cm. of Pb at altitudes corresponding with 76, 51, and 45 cm. Hg are independent of shield at each elevation. The latitude ratios are 1.16, 1.27, and 1.30, respectively. A comparison of the contributions to ionisation by penetrating and secondary radiation in relation to vertical rays and showers is made.

II. Data for comparisons of frequencies of occurrence of various sized bursts at different altitudes agree, for the smallest burst-groups, with counter measurements on showers, and, for the largest bursts, with ionisation chamber data. The max. of burst production-absorption curves shift to greater Pb thicknesses with increasing burst size.

N. M. B.

Disintegration processes by cosmic rays with the simultaneous emission of several heavy particles. M. BLAU and H. WAMBACHER (Nature, 1937, 140, 585).—The long-range ionisation tracks observed to start from a common focus in the emulsion of a photographic plate which had been exposed to cosmic radiation for 5 months at an altitude of 2300 m. are considered to have been produced by disintegration of an atom, probably of Ag or Br, in the emulsion by a cosmic ray.

L. S. T.

Production of showers by heavy particles. L. LANDAU and G. RUMER (Nature, 1937, 140, 682).—The limiting val. which the frequency of ionising showers at sea-level and under the earth reaches in a Pb layer of increasing thickness is explained by irradiation with heavy particles that easily penetrate the Pb. A formula for the probability that a shower produced by a photon emitted by a heavy particle emerges from a layer of sufficient thickness is given.

L. S. T.

Shower production (A) under thick layers of various materials, (B) in various materials. K. Z. MORGAN and W. M. NIELSEN (Physical Rev., 1937, [ii], 52, 564—567, 568—569).—(A) From observations by Geiger-Müller counters on showers from Pb and Fe over a wide thickness range, data for Pb-Fe and Fe-Pb transition curves are given. Results are in qual. agreement with the multiplicative theory of cosmic-ray shower origin with the assumption of the generation of additional shower producing radiation in the lower layers of material.

(B) Increases of counting rate due to shower production by layers of equal at. density of Cu, Sn, and Pb vary as a power of the at. no. slightly but significantly $>$ the second. N. M. B.

Geometrical model of the atomic nucleus. W. WEFELMEIER (Z. Physik, 1937, 107, 332—346).—An extension of earlier work (A., 1937, I, 492).

L. G. G.
Theory of scattering of protons by protons. (SR) A. EDDINGTON (Proc. Roy. Soc., 1937, A, 162, 155—174).—A system consisting of an electron and a proton is neutral and there is no electric interaction between the system and the rest of the universe. For two protons this interaction cannot be neglected, and when account is taken of it an extra energy term appears in the wave equations defining a potential well. The consts. of the well are in agreement with those observed. The investigation provides a foundation for the theory of at. nuclei. It is suggested that the magnitude of the potential well should not vary much for different nuclei, but that its intensity should be approx. \propto the at. no. As the potential is gravitational, not electrical, the energy of a neutron is nearly the same as that of a proton. G. D. P.

Binding forces between elementary nuclear particles. E. A. HYLLERAAS (Z. Physik, 1937, 107, 258—272).—Theoretical. The ground state of ^3H , ^3He , and ^4He is considered. L. G. G.

Saturation property of nuclear forces. E. FEENBERG (Physical Rev., 1937, [ii], 52, 667—668; cf. A., 1937, I, 341).—Mathematical. N. M. B.

Comparison of proton-proton and proton-neutron interactions. G. BREIT and J. R. STEHN (Physical Rev., 1937, [ii], 52, 396—399).—A comparison based on the data of Tuve (cf. A., 1937, I, 5) and Amaldi (cf. *ibid.*, 58). The singlet S level of D is discussed. N. M. B.

Relativistic effects for the deuteron. S. SHARE and G. BREIT (Physical Rev., 1937, [ii], 52, 546—551; cf. A., 1937, I, 214).—Mathematical. N. M. B.

Some multiple processes between electrons, positrons, and light quanta. B. KOCKEL (Z. Physik, 1937, 107, 153—176).—Theoretical. Action cross-sections for processes between electrons, positrons, and light quanta in which two light quanta participate are compared with similar processes in which three light quanta are involved. L. G. G.

Calculation of the time interval T between two successive collisions of an electron with the molecules of the ionosphere. T. V. IONESCU (Compt. rend., 1937, 205, 569—571).—Vals. calc.

on the basis of the author's theory (cf. *ibid.*, 363) are in agreement with experimental and wave-mechanical vals. A. J. E. W.

Determination of e/m for an electron by a new deflexion method. II. F. G. DUNNINGTON (Physical Rev., 1937, [ii], 52, 475—501).—A detailed development of a preliminary report (cf. A., 1933, 444). The final val. as free as possible from experimental and subjective errors is $(1.7597 \pm 0.0004) \times 10^7$ e.m.u., but is about 1.25 parts in $10^3 >$ that found in recent spectroscopic determinations. The present most probable val. based on the work of investigators in the last 10 years is $(1.7584 \pm 0.0003) \times 10^7$ e.m.u. N. M. B.

Ratio e/m for primary β -rays from radium- E . C. T. ZAHN and A. H. SPEES (Physical Rev., 1937, [ii], 52, 524—525).—Investigations using a reversed Bucherer type method show that the assumption of β -particles of mass $>$ for normal electrons, as recently suggested by cloud-chamber experiments, is untenable. N. M. B.

Multiplet structure in a crystalline electric field of cubic symmetry. G. J. KYNCH (Trans. Faraday Soc., 1937, 33, 1402—1418).—Theoretical. J -levels for rare-earth ions are given, and some general theorems of matrix elements of crystal potential energies are proved. H. J. E.

Application of the virial theorem to approximate molecular and metallic eigenfunctions. J. O. HIRSCHFELDER and J. F. KINCAID (Physical Rev., 1937, [ii], 52, 658—661).—Mathematical. A simple method of modifying the approx. charge distributions to satisfy the virial theorem is developed. N. M. B.

New method for the production of light sources of constant energy in the visible spectrum. M. VON ARDENNE (Z. Physik, 1937, 107, 414—419).—When Ag-activated Zn-CdS phosphors differing only in CdS content are irradiated with cathode rays or ultra-violet light, the resultant fluorescence spectrum maxima are of const. abs. intensity. A commercial tube is described with a four-component fluorescing plate which gives rise to a const.-intensity spectrum over the range 6800—4300 Å. and of which the four intensity maxima are equally distributed along the range of λ . The range may be extended by means of a fifth component to 3700 Å. and the tube can be used in any common cathode-ray tube exciting circuit. L. G. G.

Rotational quantum numbers in single Q branches. L. A. TURNER and W. T. HARRIS (Physical Rev., 1937, [ii], 52, 630—631).—An improved graphical method, applicable to a single band, for determining rotational quantum numbers and rotational consts. of Q branches is given. N. M. B.

New band system of the C_2 molecule. J. G. FOX and G. HERZBERG (Physical Rev., 1937, [ii], 52, 638—643).—Analyses are tabulated for the 0—3, 0—4, 0—5, and 0—6 bands at 2855, 2987, 3129, and 3283 Å. of a new C_2 band system. The lower state $^3\Pi$ is the same as for the Swan bands; the upper is a new $^3\Pi_u$ state. Rotational and vibrational consts. are calc. or corr., and the electron configuration is

discussed. Some other bands (unanalysed), probably due to C_2 , are given. N. M. B.

Some new magnesium hydride bands. A. GUNTSCH (Z. Physik, 1937, 107, 420—424).—The $2\Pi^* \rightarrow 2\Sigma$ transition of the 1—0 band is discussed. Consts. for a no. of new bands are given, some of which are ascribed to unknown states of the mol.

L. G. G.

Ultra-violet bands of magnesium hydride. L. A. TURNER and W. T. HARRIS (Physical Rev., 1937, [ii], 52, 626—630).—From a detailed study and extension of the $2\Pi^* \rightarrow 2\Sigma$ system of MgH , vals. of consts. of the $2\Pi^*$ state are obtained. Assignments of K vals. in the MgH and MgD bands are corr., and difficulties in the interpretation of the λ 2348 band of MgH and the λ 2360 band of MgD are discussed.

N. M. B.

Transfer of rotational energy in molecular collisions. II. Exchange of energy in collisions between unexcited HgH and N_2 molecules. F. RIEKE (J. Chem. Physics, 1937, 5, 831—835; cf. A., 1936, 1176).—The influence of primary light on the intensity distribution in the HgH 4017 band excited by sensitised fluorescence in the mixture $Hg + H_2 + N_2$ indicates a very slow exchange of vibrational energy in collisions between N_2 and HgH mols. in their normal electronic states. Additional experiments rule out other causes, such as self-reversal and reactions involving high-energy Hg atoms formed by stepwise excitation.

W. R. A.

Cameron bands ($3\Pi \rightarrow 1\Sigma$) of carbon monoxide. L. GERO, G. HERZBERG, and R. SCHMID (Physical Rev., 1937, [ii], 52, 467—471).—The 0—0 and 1—0 Cameron bands of CO were investigated in absorption with high dispersion and data for the lines of three P , three Q , and three R branches observed for each band are tabulated. Vals. of consts. are calc. The upper state of the third positive group of CO is $3\Sigma^+$. The electronic excitation energy of the $a^3\Pi$ level is 48,473.7 cm.⁻¹

N. M. B.

Absorption spectrum of F_2O_2 . P. H. BRODERSEN, P. FRISCH, and H. J. SCHUMACHER (Z. physikal. Chem., 1937, B, 37, 25—29).—Between 2000 and 10,000 Å. the spectrum is a slightly undulating continuum. Absorption begins at about 5900 Å. and the extinction coeff. increases with falling λ . R. C.

Ultra-violet absorption spectrum of nitrogen dioxide. A. IONESCU (J. Phys. Radium, 1937, [vii], 8, 369—374; cf. A., 1932, 1187).—A rotational analysis of the band at 2491 Å. is given; the band is attributed to a transition in which a change of electric moment occurs along the O atom axis. The dissymmetry of the mol. is small. The N—O interat. distance in the unexcited mol. is approx. 1 Å., the valency angle being 107°; in the excited mol. the vals. are 2.15 Å. and 87°. Vals. of I for the unexcited and excited mols. are given. A. J. E. W.

Spin doubling in 2Σ states of AlO . M. K. SEN (Indian J. Physics, 1937, 11, 251—281).—The rotational structure of the (1,0) (0,0) (0,1) (2,1) (1,1) and (1,2) bands of AlO in the system $2\Sigma \rightarrow 2\Sigma$, λ 4100—5700 have been analysed. Spin doubling in both the upper and lower states is found. F. J. L.

Spectra of silicon fluoride. T. YUASA (Sci. Rep. Tokyo Bunrika Daigaku, 1937, 3, A, 195—203).

—Data are tabulated for three new band systems of SiF : 3839—3293, 3365—3198, both degraded towards the red, and 3413—3244 Å., degraded towards the violet. For the first-mentioned system a vibrational analysis is given; the ground state is probably the fundamental level of SiF . Consts. are evaluated.

N. M. B.

Ultra-violet band systems of (A) $GeCl$ and $GeBr$, (B) germanium monoxide. W. JEVONS, L. A. BASHFORD, and H. V. A. BRISCOE. (C) **Ultra-violet band systems of $SnBr$ and $SiBr$.** W. JEVONS and L. A. BASHFORD (Proc. Physical Soc., 1937, 49, 532—542, 543—553, 554—567).—(A) Data are given for band systems developed in the ranges λ 3202—2847, and 3260—2946 for $GeCl$ and $GeBr$, respectively, in heavy-current tube-discharges through continuous flows of $GeCl_4$ and $GeBr_4$ vapours. Each consists of two subsystems of bands degraded towards shorter λ , and expressions for the heads are found. Electronic intervals δv_e , upper state energies (system-origins) v_e , and vibrational coeffs. ω_e and $x_e\omega_e$ for both electronic states are compared with those of band systems of other monohalides of the same group. With increasing at. no. and mass of either atom the expected trend is observed in each case: an increase in δv_e , and decreases in v_e , ω_e , and $x_e\omega_e$, except for δv_e in $SiBr$ and the Pb monohalides; the apparent anomalies are discussed.

(B) Measurements reported for the GeO band system by Shaw (cf. A., 1937, I, 110) are extended over the range λ 3319—2441 in an uncondensed discharge through a mixture of $GeCl_4$ vapour and O_2 flowing continuously through the discharge tube. Data for 32 bands are given, and an expression for the heads is found. The system is attributed to ^{74}GeO , and measurements for some heads probably due to ^{72}GeO and ^{70}GeO are recorded. Data are compared with those for band systems of other monoxides and monosulphides of the same group, and observed decreases of v_e , ω_e , and $x_e\omega_e$ with increasing at. no. or mass of either atom are shown graphically.

(C) The ultra-violet systems of $SnBr$ and $SiBr$ developed in heavy-current tube-discharges through continuous flows of $SnBr_4$ and $SiBr_4$ vapours were investigated in relation to those of other monohalides of the same group. $SnBr$ has two systems: at λ 3428—3021, degraded towards the further ultra-violet, and at λ 3709—4255, degraded towards the red. Data and analyses are tabulated, and expressions for the heads are found. Miescher's analysis (cf. *ibid.*, 392) of the $SiBr$ system is modified to include a few hitherto unobserved band-heads, and in analogy to the $SiCl$ and $GeBr$ systems. N. M. B.

Absorption spectra of some carbon and tin halides in the vapour state. Y. P. PARTI and R. SAMUEL (Proc. Physical Soc., 1937, 49, 568—586).—The absorption spectra of the vapours of $SnCl_2$, $SnBr_4$, and of mols. of the types CX_4 , CHX_3 , and CH_2X_2 ($X = Cl, Br, I$) were investigated. The no. of max. and their energy differences and a comparison of the beginnings of the various absorption regions with thermochemical data indicate that the first

process of photo-dissociation corresponds with $\text{MX}_4 \rightarrow \text{MX}_2(^1\Sigma) + 2\text{X}$; the further absorption regions are due to one or two excited halogen atoms.

N. M. B.

Absorption spectra of monosulphides of alkaline-earth elements and their latent heats of vaporisation. L. S. MATHUR (Proc. Roy. Soc., 1937, A, 162, 83—94).—An experimental investigation shows that SrS and BaS have two, CaS one, region of absorption. The latent heats are calc. from the long- λ limits of the first continuous absorption.

G. D. P.

Absorption spectrum of $\text{Tm}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$. H. A. BETHE and F. H. SPEDDING (Physical Rev., 1937, [ii], 52, 454—455).—Calculations support the view that the absorption spectra of rare-earth salts are due exclusively to transitions within the 4f shell (cf. Freed, A., 1937, I, 110).

N. M. B.

Absorption spectrum of iodine molecules adsorbed on salts. N. B. BARAKAN (J. Phys. Chem. Russ., 1937, 9, 364—375).—Ti, Cs, K, Na, and NaCl were used. λ varied between 200 and 600 m μ . The spectrum of CsI + I resembles that of CsI₃.

J. J. B.

Absorption spectrum of an atomic solution of tellurium in sulphuric acid. Z. V. BOIZOVA and K. V. BUTKOV (J. Phys. Chem. Russ., 1937, 9, 553—558).—The extinction coeff. has been measured between 260 and 620 m μ . There is a max. at 520 and a min. at 390 m μ . Beer's law is followed.

J. J. B.

Light absorption and its significance for chemical questions. H. FROMHERZ (Z. Electrochem., 1937, 43, 791—796).—A lecture. The laws of light absorption are stated and the application of absorption measurements to some determinations of concn. and constitution explained.

J. W. S.

Optical interaction of chromophores in the same molecule. W. AUMULLER, H. FROMHERZ, and C. O. STROTHER (Z. physikal. Chem., 1937, B, 37, 30—36).—Measurements of the extinction coeffs. of solutions of aliphatic dibromides and di-iodides have shown that the absorption of a mol. with two chromophores separated by at least one CH_2 is the sum of the effects due to the chromophores separately. If the chromophores are attached to adjacent C atoms or the same C atom the absorption is intensified and shifted towards the red, and this effect becomes more pronounced if the H adjacent to the chromophores are replaced by alkyl, irrespective of the nature of the latter. It appears that the interaction of chromophores does not depend on their ability to form a conjugated system of double linkings, but rather on their sp. properties, such as polarisation.

R. C.

Absorption spectrum of formic acid in the vacuum ultra-violet. W. C. PRICE and W. M. EVANS (Proc. Roy. Soc., 1937, A, 162, 110—119).—A no. of discrete absorption bands in the region below 1550 Å. is observed. The vibrational structure is discussed and the bands are attributed to the excitation of electrons in the carbonyl O atoms.

G. D. P.

Absorption spectrum of diacetylene in the near ultra-violet. II. S. C. WOO and T. C. CHU (J. Chem. Physics, 1937, 5, 786—791; cf. A., 1935, 1299).—Using an apparatus of high dispersion the spectrum of $(\text{CH}_3\text{C})_2$ consists of sharp, narrow, closely-spaced bands in the region 2970—2650 Å., whilst below 2650 Å. the bands are more diffuse but with a comparatively simpler gross structure. Normal vibrations and symmetry properties of the mol. are discussed and frequencies of —2100 and 1900 cm^{-1} are assigned respectively to the totally symmetrical and the anti-symmetrical longitudinal frequencies of the C:C linkings in the excited state.

W. R. A.

Absorption spectrum and molecular structure.

I. Aromatic amines. S. KATO and F. SOMENO (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 33, 209—230).—The intense diffuse band system of NH_3 and the NH_2 group in the region 1900—2400 Å. is attributed to excitation of the normal $[\text{Za}_1]$ to the lowest excited state of a $2p(z)$ electron of the N atom. From comparisons of the spectra of NH_2Ph , C_6H_5 , PhMe , and PhOH it is concluded that the pairing of $2p(z)$ electrons is not destroyed by the effect of strong interaction with the orbitals of the Ph radical, but the electron configuration is unstabilised or their symmetry deformed. The conclusions are used to explain the formation of NH_4 salts and are applied to the interpretation of the spectra of more complicated aromatic amines.

J. W. S.

Organic photochemistry. VI. Spectro- and photo-chemical study of the colour sensitiser of dialkylaminoarylpolymermethinecycloammonium.

S. YOSHIMURA and S. SAKURAI (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 1071—1098).—The absorption max. in the tetramethine series occurs at λ 500 Å. > for the dimethine series, whilst the sensitising max. for the former is about 680 Å. > for the latter.

J. W. S.

Absorption of systems. Spectra of Δ^1 -p-menthen-3-one, p-xylquinone, thujone, cyclohexanone, menthone, cyclopentanone, and cyclohexene. H. MOHLER and H. LOHR (Helv. Chim. Acta, 1937, 20, 1183—1188; cf. A., 1937, I, 217, 393).—Data are recorded for the absorption spectra of solutions in C_6H_{14} . The effects of the positions of the double linkings are discussed.

J. W. S.

Optical absorption of porphyrins. XII. Metal complexes. A. STERN and M. DEZELIĆ (Z. physikal. Chem., 1937, 180, 131—138; cf. A., 1937, I, 442).—The absorption spectra of metal complex salts of mesoporphyrin-IX Me_2 ester in the visible vary considerably, the differences being related to the state of combination of the metal atoms.

R. C.

Chemical war materials. V. Discussion of the absorption bands of $\beta\beta'$ -dichlorodiethyl sulphide. H. MOHLER (Helv. Chim. Acta, 1937, 20, 1188—1192; cf. A., 1937, I, 217).—The absorption spectra of $(\text{OH}\cdot\text{CH}_2\cdot\text{CH}_2)_2\text{S}$, Et_2S , thiophen, $(\text{CH}_2\text{Cl}\cdot\text{CH}_2)_2\text{SO}$, $(\text{CH}_2\text{Cl}\cdot\text{CH}_2)_2\text{SO}_2$, and diethylene disulphide have been investigated in the region 2000—3000 Å. The results suggest that the selective

absorption of $(\text{CH}_2\text{Cl}\cdot\text{CH}_2)_2\text{S}$ is attributable to excitation of the electrons of the S atom.

J. W. S.

Ice, liquid water, and its solution in dioxan in the near infra-red. G. BOSSCHETER and J. ERRERA (Compt. rend., 1937, 205, 560—562; cf. A., 1937, I, 495).—Transmission curves for the ν range 2700—3700 cm^{-1} are given. H_2O gives a min. at 3400 cm^{-1} , attributed to H linkings between adjacent mols., and an inflexion at 3250 cm^{-1} . Ice gives a min. at 3250 cm^{-1} , probably due to H linkings in the crystal lattice, and inflexions at 3350 and 3150 cm^{-1} . H_2O in dioxan gives a band system at 3530 cm^{-1} ascribed to H linkings between dioxan and H_2O mols.

A. J. E. W.

Optical absorption of solutions of coloured inorganic salts in the near infra-red. T. DREISCH and W. TROMMER (Z. physikal. Chem., 1937, B, 37, 37—59).—All the Cu salts examined, except $\text{Cu}(\text{OAc})_2$, had the same form of absorption curve and the same was true of the Ni salts, but the absorption max. of the amino-salts were displaced towards the blue compared with those of the aquo-salts and the absorption was more intense. Hexo-aquocobaltous salts (I) have a band with fine structure at 1.23 μ , irrespective of the anion. Aq. and EtOH solutions of $(\text{NH}_4)_2\text{Co}(\text{CNS})_4$ have a band at 1.23 μ , but the absorption intensity is for (I). Mixed solutions of Co^{II} halides with the corresponding halogen acids have an absorption max. between 0.6 and 0.85 μ . and between 1.5 and 2.5 μ ; the position and intensity vary with the halogen. Complex Co^{III} salts absorb in the visible at about 5000 \AA , but not in the infra-red. The results are consistent with the theory that in the solid and dissolved blue compounds of Co the Co atom is surrounded by four atoms or groups and in the red compounds by six. Two new bands at 1.8 and 2.15 μ . have been observed for NH_4^+ . The absorption max. of H_2O at 0.98 and 1.46 μ . have been resolved into max. at 0.98 and 1.01, and 1.445 and 1.468 μ , respectively.

R. C.

Infra-red spectrum of tetradeuteroethylene. G. B. B. M. SUTHERLAND and G. K. T. KONN (Nature, 1937, 140, 644—645).—Four more of the twelve fundamental frequencies of C_2D_4 have been identified from a study of the infra-red spectrum.

L. S. T.

Two bands in the infra-red spectrum of formaldehyde. E. S. EBERS and H. H. NEILSEN (J. Chem. Physics, 1937, 5, 822—827).— CH_2O vapour has been examined between 1 μ . and 15 μ .; regions of intense absorption occur near 3.5, 5.7, 6.7 μ ., and from 7.5 to 10 μ . Exploration of the region 7.5—10 μ . with a grating spectrometer has revealed two bands, rather intense and overlapping, which appear to arise from oscillations of the electric moment perpendicular to the axis of symmetry. Consideration of their features indicates that they are oscillations at right angles to each other and are ν_5 and ν_6 in Sutherland and Dennison's notation (A., 1935, 569). Their centres are at 1278 and 1165 cm^{-1} . The anomalous spacing of the principal rotation lines is attributed to interaction between rotation and the two oscillations which are only slightly anisotropic.

W. R. A.

Geometrical structure of the CH_3N_3 molecule. E. BLUM and H. VERLIGER (Physikal. Z., 1937, 38, 776).—The rotation-vibration spectrum of CH_3N_3 has been photographed in the infra-red. It is concluded that the structure of the CH_3N_3 mol. is symmetrical, with the four atoms C-N-N-N in a straight line (cf. A., 1933, 1222).

A. J. M.

Infra-red absorption spectra of the stereoisomerides of cystine.—See A., II, 488.

Raman spectrum of sulphur dioxide in different states. H. GERDING and W. J. NIJVELD (Rec. trav. chim., 1937, 56, 968—982).—Details are given of results previously recorded (A., 1936, 359). Only small displacements of the Raman lines are observed in SO_2 - SO_3 and SO_2 - CCl_4 mixtures, and the spectra are approx. the superposed spectra of the components.

J. W. S.

Intensity of Raman lines due to intermolecular oscillations. (A) S. C. SIKKAR. (B) C. S. VENKATESWARAN (Current Sci., 1937, 6, 92—93, 93).—(A) Contrary to Venkateswaran (A., 1937, I, 496) the new lines in the vicinity of the Rayleigh line observed in solid compounds are due to intermol. (cf. *ibid.*, 282) and not to lattice oscillations, comparison with diamond not being relevant because the whole crystal behaves as a single mol.

(B) As the lines are depolarised they cannot be due to intermol. oscillations of polymerides. The experimental data are contradictory.

F. R. G.

Raman effect in sulphonitric mixtures. J. CHÉDIN (Ann. Chim., 1937, [xi], 8, 243—315).—A comprehensive report of available results and of investigations previously announced (cf. A., 1936, 9, 279, 649; 1937, I, 112).

N. M. B.

Raman spectra of the compounds POCl_3 , PSCl_3 , $\text{PO}(\text{OMe})_3$, and $\text{PS}(\text{OMe})_3$. A. SIMON and G. SCHULZE (Naturwiss., 1937, 25, 669).—The Raman spectra of compounds of the type POX_3 and PSX_3 were determined and compared with that of H_3PO_4 . If the latter has the form $\text{PO}(\text{OH})_3$ the Raman spectra of $\text{PO}(\text{OMe})_3$ and $\text{PS}(\text{OMe})_3$ should be similar to that of the acid. The spectra of both esters are, however, much more complex than that of H_3PO_4 , indicating a lesser degree of symmetry of the mol. The symmetry of the esters is also < that of POCl_3 or PSCl_3 .

A. J. M.

Raman spectra of inorganic compounds. O. REDLICH, T. KURZ, and W. STRICKS (Monatsh., 1937, 71, 1—5).—Raman spectra of H_2SnBr_6 , MgSnBr_6 , H_2SeCl_6 , SbCl_5 , AsBr_3 , and NaH_2PO_2 have been investigated. In aq. solution SnBr_6^{--} is not octahedral, but of lower symmetry, probably D_{4h} . The existence of SeCl_6^{--} is confirmed. NaH_2PO_2 gives 6 lines and shows the expected H frequencies.

E. S. H.

Hexaco-ordination of tellurium, molybdenum, and tungsten. J. GUPTA (Nature, 1937, 140, 685).—The Raman spectra of aq. H_2TeO_4 , NH_4 and K molybdates, Na and K tungstates show only three lines in each case (data given), and their characteristics indicate that these substances at room temp. exist as octahedral units, two O being co-ordinated

to the central atoms from the two H_2O mols. of hydration. L. S. T.

Free rotation in the oxalate group and the resonance bond of carboxyl. J. GUPTA (Indian J. Physics, 1937, **11**, 231—238).—The Raman spectra of solid $(\text{NH}_4)_2\text{C}_2\text{O}_4$ and $\text{K}_2\text{C}_2\text{O}_4$ and in aq. solution have been examined. There is free rotation about the C-C bond of the oxalate group in solution, and assuming the O-C-O angle to be 129° the C-O bond is calc. to be 1.30 Å. F. J. L.

Constitution of oxonium compounds. Raman spectra of acid additive compounds of simple aliphatic alcohols and ethers. G. BRIEGLEB and W. LAUPPE (Z. physikal. Chem., 1937, **B**, **37**, 260—284).—A detailed account of investigations the principal results of which have already been recorded (A., 1937, **I**, 497). R. C.

Raman effect of some aliphatic monoximes. M. MILONE (Gazzetta, 1937, **67**, 527—529).—Measurements of the Raman spectra of some aliphatic monoximes show that they are true oximino-compounds and do not exist in tautomeric forms. O. J. W.

Lines attributed to a possible pyrrolenine form in the Raman spectrum of pyrrole. G. B. BONINO and R. MANZONI-ANSIDEI (Atti R. Accad. Lincei, 1937, [vi], **25**, 489—493; cf. A., 1937, **I**, 10).—The existence of a pyrrolenine form of $\text{C}_4\text{H}_5\text{N}$ (cf. A., 1936, 546) is not confirmed by Raman spectrum measurements. O. J. W.

Raman spectrum of N-deuteropyrrole. G. B. BONINO and R. MANZONI-ANSIDEI (Atti R. Accad. Lincei, 1937, [vi], **25**, 494—497; cf. A., 1937, **I**, 10).—The Raman spectra of $\text{C}_4\text{H}_5\text{N}$ and of $\text{C}_4\text{H}_4\text{ND}$ are compared. The results confirm the existence of a form of $\text{C}_4\text{H}_5\text{N}$ in which the direction of the N-H linking is not coplanar with the plane of the ring. O. J. W.

Molecular symmetry of pyrrole. G. B. BONINO (Atti R. Accad. Lincei, 1937, [vi], **25**, 502—508; cf. A., 1937, **I**, 283).—Possible symmetry types of $\text{C}_4\text{H}_5\text{N}$ and of $\text{C}_4\text{H}_4\text{S}$ are discussed. O. J. W.

Structure of benzene. X. Intensities of the Raman lines in benzene and hexadeuterobenzene. R. C. LORD, jun., and E. TELLER (J.C.S., 1937, 1728—1737; cf. A., 1936, 1322).—The quite irregular changes in the intensities of Raman lines and infrared absorption bands on isotopic substitution of D for H in C_6H_6 are explained on a theory which is developed and quantitatively illustrated with respect to the Raman lines. To calculate the intensity changes it is necessary to consider collectively the dynamically inter-related vibrations of a symmetry class and also any rotations belonging to that class because these rotations, as well as the vibrations, can change the dipole moment vector and the polarisability tensor on which respectively absorption and scattering depend. The intensity changes for several symmetry classes have been considered. Calc. intensities agree well with experimental vals. W. R. A.

Phosphorescence of zinc sulphide. E. BAUR (Helv. Chim. Acta, 1937, **20**, 878; cf. A., 1937, **I**, 626).—It is suggested that the phosphorescence of Sidot

blende is due to the decomp., in light, into Zn and S, the latter associating with ZnS during the illumination, but subsequently reacting again with the scattered Zn atoms to re-form ZnS, with emission of the phosphorescent radiation. J. W. S.

Fluorescence efficiencies of solutions of hydrocarbons. E. J. BOWEN and J. W. SAWTELL (Trans. Faraday Soc., 1937, **33**, 1425—1429).—Fluorescence efficiencies of solutions of C_6H_6 , C_{10}H_8 , anthracene, phenanthrene, CHPh_3 , and fluorene in EtOH and C_6H_{14} have been measured for λ 2540—3665 Å., using a photo-cell combined with an "integrating screen." This provided a uniform λ sensitivity over the necessary range. H. J. E.

Triboluminescence of certain natural crystals and synthetically prepared materials. (Miss) F. G. WICK (J. Opt. Soc. Amer., 1937, **27**, 275—285).—Factors that may be concerned in the emission of triboluminescence are: (a) emission closely resembling phosphorescence and low-temp. thermoluminescence, coming from unstable excited centres activated by exposure to Ra, X-rays, or cathode rays; (b) emission characteristic of the material itself and dependent only on breaking or crushing, due to stable heat-resistant centres; (c) emission due to an electric discharge. For fluorites, synthetic materials containing CaF_2 , and the rare earths, triboluminescence is due to (a), (b), and (c), separately or together; for materials heated in the blast it is due to (b) and (c), and for those ground under liquids, in addition, it is due to (b); for sphalerite and willemite and for artificial substances showing scintillations it is due to (b) and (c); for Mg, Cd, and Na sulphates containing 1% MnSO_4 and for CaCO_3 + 1% MnCO_3 (all synthetic) and for CaF_2 + Mn and CaSO_4 + Mn, it is due to (a). Materials showing marked triboluminescence contain traces of impurities serving as activators. The intensity of triboluminescence is affected by heat-treatment. In many cases the spectrum of triboluminescence is identical with that of phosphorescence or low-temp. thermoluminescence excited by Ra. Substances which may be activated to relatively high-temp., persistent thermoluminescence or that due to exposure to Ra, cathode rays, or X-rays show triboluminescence. N. M. B.

Photo-expansion of bromine. W. SMITH, M. RITCHIE, and E. B. LUDLAM (J.C.S., 1937, 1680—1690).—The photo-expansion of Br has been investigated and an equation is developed which connects photo-expansion, thermal conductivity, total pressure, and light absorbed. In general, the addition of foreign gases facilitated the homogeneous recombination of Br atoms and increased the photo-expansion. The triple collision process is promoted by $\text{CO}_2 > \text{O}_2 > \text{N}_2 > \text{H}_2 > \text{A}$. The influence of Br pressure on the thermal conductivity and the effect of adding small amounts of H_2O vapour to the carefully dried system have also been studied. W. R. A.

Contact potentials. (A) Condensation of potassium and sodium on tungsten. R. C. L. BOSWORTH and E. K. RIDEAL. **(B) Evaporation of sodium films.** R. C. L. BOSWORTH (Proc. Roy.

Soc., 1937, A, 162, 1—31, 31—49).—(A) The experimental conditions to be satisfied in order to obtain satisfactory measurements of contact potentials by studying the infra-saturation currents in a thermionic tube are discussed. Films of Na and K condensed on W are examined and from the observed contact potentials the dipole moments of the adions are calc. The dipole moments decrease with increasing film concn. The adsorption of H on a surface partly covered with K is studied. A complete covering of H, K, or O or a mixed film precludes further adsorption of H; on a partly covered surface H may be adsorbed until a complete composite surface is formed. Investigation of the condensation of Na on W wire and ribbon shows that the latter has a much greater sp. surface than the former. Prolonged heating at high temp. increases the no. of Na atoms required to change the surface concn. by a specified amount. The v.p. of solid (285—370° K.) and of liquid (370—443° K.) Na is calc.

(B) An investigation of the evaporation of Na from W by means of measurements of contact potential shows that, on heating, an adion in the film may be excited to a higher energy level in which it is separated from the surface by a distance 0.5 Å. > the normal. Further heating produces evaporation. Spreading forces are calc.; they have a small negative temp. coeff. Consideration of the change of rate of evaporation with concn. leads to the conclusion that conc. films consist of a condensed and a diffuse phase. G. D. P.

Selective photo-effect in oxide cathodes with embedded metal atoms. R. FLEISCHER and H. PIETSCH (Z. Physik, 1937, 107, 322—331; cf. A., 1935, 808).—Red-sensitive semi-conducting photocells of the Cs-Cs₂O-Ag type, both vac. and gas-filled, show changes in selective max. with applied voltage. Up to about 2 v. the change is towards longer λ. Further increase in potential may cause retrogression of the max., which never falls behind the max. when v = 0. L. G. G.

Electrical and optical properties of semi-conductors. XIII. Measurements on cadmium, thallium, and tin oxides. G. BAUER (Ann. Physik, 1937, [v], 30, 433—445; cf. Baumbach and Wagner, A., 1933, 887; Meissner *et al.*, *ibid.*, 894).—Measurements have been made of the electrical conductivity, Hall const., thermoelectric effect, and infra-red absorption from 1 to 6 μ. of thin films of Cd, Tl, and Sn deposited on quartz or glass and oxidised by heating in O₂. The variation in these properties with the extent of oxidation is described. The compounds behave as electron excess conductors but show peculiarities. O. D. S.

Becquerel effect in galena. F. FISCHER, B. GUDDEN, and M. TREU (Z. Physik, 1937, 107, 200—204).—The photo-electric effect of PbS (from various sources) in contact with electrolytes is measured during illumination by an interrupted beam of white light. Synthetic and fused natural PbS show no effect. L. G. G.

Influence of contact resistance on the rectifying and photo-electric properties of barrier-layer

cells. J. ROULLEAU (Ann. Physique, 1937, [xi], 8, 153—236).—A general method is given for determining the resistance of the contact film assumed to exist between a metal and a semi-conductor, and this is shown to depend, in the case of metal-Cu₂O, on the temp., resistivity of the Cu₂O, and nature of, and time interval from, the treatment of the Cu₂O. A relation exists between the photo-electric effect and the rectifying effect; the anomalies of the temp. coeffs. of these effects are only apparent. There is evidence in the Becquerel effect of the superposition of electrochemical and contact film effects. Interpretations afforded by contemporary theories are not, in general, in accord with experimental results.

N. M. B.

Theory of metals according to the Thomas-Fermi method. B. MROWKA and A. RECKNAGEL (Physikal. Z., 1937, 38, 758—765).—The no. of conductivity electrons and emission work may be calc. on the basis of the Thomas-Fermi method, giving qual. agreement with experiment. A. J. M.

Conductivity of cuprous oxide. J. GUNDERMANN, K. HAUFFE, and C. WAGNER (Z. physikal. Chem., 1937, B, 37, 148—154).—The relation previously recorded (A., 1933, 887) between the sp. conductivity and the O₂ pressure has been confirmed at 900° over a wider pressure range. At very low pressures there is an indication of a change to electronic conduction, independent of the pressure (cf. A., 1936, 138). Under low pressures at 700° and 800° the conductivity varies irregularly. The decomp. pressures of Cu₂O have been calc. from existing e.m.f. data. R. C.

Conductivity of cupric oxide. J. GUNDERMANN and C. WAGNER (Z. physikal. Chem., 1937, B, 37, 157—160).—The conductivity at room temp. depends on the previous history and is the lower the higher was the temp. and the lower the O₂ pressure at the latest equilibration with the gas phase. R. C.

Dielectric strengths of CCl₂F₂-air and SO₂-air mixtures. C. M. HUDSON, L. E. HOISINGTON, and L. E. ROYT (Physical Rev., 1937, [ii], 52, 664—665; cf. A., 1937, I, 221).—Sparking potential-partial pressure curves for total pressures 14—100 lb. per sq. in. are given. The dielectric strengths of pure CCl₂F₂ and SO₂ are, respectively, 3.0 and 2.7 times as great as that of pure air. In the case of CCl₂F₂-air the dielectric strength > the sum of the dielectric strengths of the components. N. M. B.

Dielectric constant of titanium dioxide at low temperatures. H. BUTTNER and J. ENGL (Z. tech. Physik, 1937, 18, 113—117).—The dielectric const. of powdered TiO₂, containing 1.4% SiO₂ and traces of Fe and of metals of the H₂S group, and ignited at 1380° to remove H₂O, has been measured at audio-frequencies and temp. from 0° to -180°. No anomalies dependent on temp. were observed.

O. D. S.

Dispersion and absorption with ultra-short waves. (A) Dioxan-water mixtures as comparison liquids at high frequency. W. HACKEL and M. WIEN. (B) Dispersion and absorption of water in the infra-red and the Debye dipole

theory. G. HETTNER. (C) Reflexion and absorption determinations in water and alcohols with centimetre waves. A. ESAU and G. BAZ (Physikal. Z., 1937, 38, 767—770, 771—774, 774—775).—(A) Mixtures of dioxan and H_2O in different proportions enable liquids of dielectric const. 2.3—80 to be obtained. The high-frequency conductivity of dioxan- H_2O mixtures has been determined. In agreement with the Debye theory, the dipole conductivity for long $\lambda \propto \lambda^{-2}$. To increase the val. of such mixtures as comparison liquids for dielectric loss determinations electrolytes may be added.

(b) The variation of the optical consts. (n , and absorption coeff. $\kappa\lambda$) with λ has been determined for H_2O in the infra-red. There are marked deviations from Debye's dipole theory.

(c) The dispersion and absorption of H_2O , MeOH , and EtOH have been determined at λ 2.8—10 cm. Used in conjunction with previous results, the observations give for the transition λ , H_2O , 1.85 cm., MeOH , 12.8 cm., EtOH , 28.4 cm. These results agree with Debye's theory. A. J. M.

Absorption bands in polar substances at very high radio-frequencies. I, II. L. CAVALLARO (Atti. R. Accad. Lincei, 1937, [vi], 25, 382—387, 509—515).—I. The theory of the absorption of high-frequency radiation by polar substances is reviewed.

II. The absorption of $\text{Bu}^\alpha\text{OH}$ and Bu^βOH at -40° to 60° in the region $\lambda = 5$ —22 m. has been measured. The results agree with those of Mizushima (A., 1926, 1082). O. J. W.

Dielectric constant of isopropyl alcohol vapour. J. D. STRANATHAN (J. Chem. Physics, 1937, 5, 828—830).—Measurements of the dielectric const. at 12 different temp. between 26.8° and 190.4° , and at several different v.p. for each temp., yield 1.682 ± 0.007 D. for the electric moment of Pr^βOH .

W. R. A.

Determination of the electric dipole moment of the two tautomeric forms of ethyl acetoacetate. M. BEYAERT (Natuurwetensch. Tijds., 1937, 19, 197—213).—From measurements of ϵ of $\text{CH}_2\text{Ac}\cdot\text{CO}_2\text{Et}$ in CS_2 solution at room temp. and at -80° the val. of μ is 2.04 and 3.22 D. for the enol and keto-forms at -80° and 18.2° , respectively. S. C.

Molecular polarisation and dipole moments of *o*-, *p*-, and *m*-dimethylcyclohexane. G. M. PANTSCHENKOV and V. F. ORESCHKO (J. Phys. Chem. Russ., 1937, 9, 704—712).—A method for measuring dielectric consts. to 1 part in 10^5 is described. Mol. polarisations are measured in C_6H_6 solutions. They decrease linearly with concn. The dipole moments are zero for all three compounds. All C atoms in cyclohexane and in its Me_2 derivatives are thus situated at centres of regular tetrahedra. E. R.

Molecular volumes and expansivities of liquid normal hydrogen and parahydrogen. R. B. SCOTT and F. G. BRICKWEDDE (J. Res. Nat. Bur. Stand., 1937, 19, 237—248).—The mol. vols. at saturation between 14° and 20.4°K . are, for normal H_2 24.747 — $0.08005T + 0.012716T^2$, and for *p*- H_2 24.902 — $0.08887T + 0.013104T^2$. The change in mol. vol. in passing from *o*- to *p*- H_2 is opposite in direction

to the change observed for other substances in passing between the states of mol. rotation and non-rotation.

F. L. U.

Relation between refraction data and reactivity of halogenated methane derivatives. J. M. STEVELS (Trans. Faraday Soc., 1937, 33, 1381—1390).—Vals. of d and μ are recorded for the various liquid halogenated CH_4 derivatives. Vals. for the bond refractions are calc. and correlated with the reactivity of these CH_4 derivatives (e.g., their reactions with at. H and Na). H. J. E.

Constitution of potassium cyanide and selenocyanate. Refractometric investigation. G. SPACU and E. POPPER (Z. physikal. Chem., 1937, 180, 154—156).—The mol. refraction indicates that both have the nitrile structure (cf. A., 1937, I, 10).

R. C.

One-electron rotatory power. E. U. CONDON, W. ALTAR, and H. EYRING (J. Chem. Physics, 1937, 5, 753—775).—Mathematical. A single electron moving in a force field, which has neither planes nor centre of symmetry, can give rise to optical rotatory power in a medium containing mols. of this type. This effect is called one-electron rotatory power and is in sharp contrast to older theories involving coupled oscillator models. The model is adapted to a consideration of the rotatory power of $\text{CHPhMe}\cdot\text{O}\cdot\text{NO}$ and *sec*- BuOH . The general quantum-mechanical theory of circular dichroism is developed and Kuhn's anisotropy factor is quantum-mechanically defined; the contribution of spins to optical rotation is considered. Experiments of Schwab *et al.* (A., 1934, 1076) on the catalytic dehydration of BuOH on active quartz are discussed and kinetic arguments are advanced to show how the relative configurations of quartz and BuOH may be inferred from such data. The relation of one-electron rotatory power to known dipole moment and solvent effects on rotatory power is briefly discussed. W. R. A.

Dependence of the Kerr electro-optic effect on temperature for carbon disulphide and Halowax oil. A. A. ZUEHLKE and L. R. INGERSOLL (J. Opt. Soc. Amer., 1937, 27, 314—317; cf. A., 1933, 1104).—The Kerr dispersion of CS_2 is independent of temp. for -100° to 20° and a range of $\lambda\lambda$, and this independence is probably general. The temp. variation of the Kerr effect for CS_2 at low temp. and Halowax at high temp. is not well represented by the Langevin-Born theory. Measurements of dielectric const. are tabulated for CS_2 over -110° to 20° and for Halowax over 20 — 140° ; the curve for CS_2 shows an abrupt increase of slope at -92° .

N. M. B.

Chemical properties of the rare gases. B. A. NIKITIN (Nature, 1937, 140, 643).—A, like Rn (A., 1936, 676), is held by $\text{SO}_2\cdot 6\text{H}_2\text{O}$ (I), and can be transferred quantitatively from the gas phase into the crystals. Ne is also taken up by crystals of (I), but less easily than A. Only traces of He are taken up under similar conditions. Ne thus forms $\text{Ne}\cdot 6\text{H}_2\text{O}$ isomorphous with (I). The different stabilities of these hydrates make it possible chemically to separate A and Rn from He and Ne, and Rn from A.

The chemical properties of A are nearer to those of Rn than to Ne. L. S. T.

Structure of inorganic peroxides. V. I. KASATOTSCHKIN (J. Phys. Chem. Russ., 1937, 9, 932—934).—Arguments against Kazarnovski's peroxide formula $\text{H}\cdot\text{O}\cdot\text{O}\cdot\text{H}$, and for the alternative formula $\text{H}_2\cdot\text{O}\cdot\text{O}$, with a "mol." O_2 , are advanced. E. R.

Constitution of aurous compounds: gold mirrors. C. S. GIBSON (Nature, 1937, 140, 583).—A discussion. The 2-covalency of Au in its aurous compounds is emphasised. The aurous like the auric ion appears to be incapable of existence. L. S. T.

Co-ordination numbers eight. W. G. PENNEY and J. S. ANDERSON (Trans. Faraday Soc., 1937, 33, 1363—1368).—Complexes are formed by Zr, Ru, Ce, Hf, Os, and Th which have a characteristic group of 24 valency electrons. The complexes formed by Mo and W have groups of 25 and 26 valency electrons, respectively. These facts are shown to be predictable from the theory of mol. orbitals. H. J. E.

Constitution of Erdmann's salt. I. B. C. RAY (J. Indian Chem. Soc., 1937, 14, 440—443).—Chemical and spectroscopic evidence is adduced which supports the view that Erdmann's salt possesses a *cis*- NO_2 -*trans*- NH_3 configuration. F. L. U.

Homeomerism, the identity of physico-chemical characteristics of substances of different composition. G. URBAIN (Bull. Soc. chim., 1937, [v], 4, 1612—1621).—A lecture.

Association coefficients and their variation as a function of temperature. P. GUARESCHI (Atti R. Accad. Lincei, 1937, [vi], 25, 516—518).—An expression for the variation of the coeff. of association of liquids with temp. is derived; it agrees well with the experimental data. O. J. W.

Interaction in molecules between rotation and slightly anisotropic oscillations. H. H. NIELSEN (J. Chem. Physics, 1937, 5, 818—822).—Mathematical. The interaction between rotation and oscillation in two-dimensional slightly anisotropic mols. is discussed quantum-mechanically, considering only rotations about an axis normal to the plane of oscillation together with its effect on the intensities and spacing of the rotational lines of the spectrum. Expressions are derived for the energies of the mol. in the normal and upper states. W. R. A.

Bond force constants and vibrational frequencies of some hydrocarbons. G. GLOCKLER and F. T. WALL (J. Chem. Physics, 1937, 5, 813—817).—Vibrational frequencies of $\text{CMe}\cdot\text{CH}$, $(\text{CMe})_2$, C_2H_2 , (CH_3C) , C_2H_6 , and CH_4 have been calc. by setting up and solving the appropriate secular equations for valency force systems. Apart from CH_4 , for which both non-degenerate and degenerate frequencies are calc., only non-degenerate frequencies are considered. Five force consts. are used and it is assumed that these remain const. irrespective of the mol. in which the bond occurs. It is also assumed that the bending consts. for the $\text{H}-\text{C}-\text{H}$ and $\text{H}-\text{C}-\text{C}$ angles are the same. These five force consts. are adequate to set up potential energy functions for each of the

29 frequencies considered. Calc. vals. are in fairly good agreement with experimental vals. both for liquids and gases. Slightly different vals. for the five force consts. are used for the two states of aggregation and the force consts. for gases are > those for liquids except for the $\text{C}-\text{C}$ bond.

W. R. A.

Theory of unsaturated and aromatic compounds. E. HUCKEL (Z. Elektrochem., 1937, 43, 827—849; cf. A., 1937, II, 450).—The properties of free radicals and the reactivities of unsaturated compounds are discussed theoretically, and various published theories are considered. J. W. S.

Systematics of band-spectral constants. I. Calculation of fundamental vibration frequencies of non-hydride di-atoms (XY type) of symmetrical molecular groups. C. H. D. CLARK. II. Interrelation of fundamental vibration frequencies of symmetrical di-atoms (XX type) in the same molecular group. C. H. D. CLARK and C. W. SCAIFE. III. Simple modification of Mutayama's relation connecting the ground state frequencies of di-atoms XX in the same groups. C. H. D. CLARK (Trans. Faraday Soc., 1937, 33, 1390—1394, 1394—1398, 1398—1401; cf. A., 1937, I, 215).—I. Theoretical. The validity of the relation $a^3 = 0.815bc^2$ is discussed, a , b , and c being fundamental vibration frequencies. II, III. Theoretical discussions. H. J. E.

Surface condensation of water vapour. N. FUKS (J. Phys. Chem. Russ., 1935, 6, 410—415; cf. A., 1935, 699).—Condensation on a completely wetted surface begins exactly at the dew point. On unwetted bodies (*e.g.*, paraffin) it begins after a supercooling of 0.015 — 0.002° , the drops appearing in repeated experiments at the same points on the surface. These centres are not all equally active. The Gibbs-Volmer theory can be tested only with very high supersaturations, when the effect of active points may be neglected. CH. ABS. (e)

Surface tension and structure of molecules. The parachor. P. CORRIEZ (J. Pharm. Chim., 1937, [viii], 26, 299—313).—A review.

Measurement of the surface tension of molten salts and metals at high temperatures. F. M. JAEGER (Chem. Weekblad, 1937, 34, 641—646).—A review. S. C.

Reduction of the fundamental laws of chemistry to a single proposition. F. MICHAUD (J. Chim. phys., 1937, 34, 507—516).—Mathematical treatment of the laws of combination by masses and vols. D. F. R.

Indexing of powder photographs. L. K. FREVEL (J. Appl. Physics, 1937, 8, 553—557).—By taking two successive exposures at const. temp. separated by about 150° , an easily measurable temp. shift which can be related to the anisotropy of a cryst. substance is obtained on a single film. Simplified means of indexing the crystallographic systems are discussed mathematically. E. S. H.

Energy of lattice distortion in cold-worked permalloy. F. E. HAWORTH (Physical Rev., 1937, [ii], 52, 613—620).—The lattice distortion produced

by severe cold-working of permalloy (70% Ni) was investigated by measuring with a focussing camera the broadening of the reflexion of the Fe $K\alpha$ doublet by the (311) planes. The broadening decreases on annealing and recovery is complete at 650°. The root-mean-square distortion was 0.31% of the lattice spacing after the material had been reduced 96% in cross-sectional area by cold-working, and the calc. energy of distortion in the hard-worked condition is 23×10^6 ergs per c.c. or 0.065 g.-cal. per g.

N. M. B.

Graphic method for the determination of the lattice constant of iron by means of cobalt rays. P. MÖLLER (Z. tech. Physik, 1937, 18, 167—169).

O. D. S.

Extension of the conception of the electronic lattice to crystals of mono-ionised salts. R. FORRER (J. Phys. Radium, 1937, [vii], 8, 375—382; cf. A., 1937, I, 116, 231).—Consideration of the m.p. and lattice characteristics of a no. of salts of the NaCl, CsCl, and ZnS types indicates the existence of an electronic lattice, in which each "contact" between neighbouring ions is effected by a pair of p electrons from each ion, an ion normally possessing three such pairs in planes at right angles. The intensity of contact in salts is comparable with that occurring in metals, and the stability of the cryst. state generally is attributed to the electronic lattice. Contacts may occur between ions of opposite sign only (e.g., in NaCl and CsCl), or, in cases where the anions are large, additional contacts between anions may be formed (e.g., in Li halides and CsI). Exceptionally (e.g., in Cu^I halides and AgI) contacts may exist between the anions alone, the cations remaining "free" and imparting good electrical conductivity to the crystal.

A. J. E. W.

Melting. V. V. SCHTUTZER (J. Phys. Chem. Russ., 1937, 9, 359—363).—The transformation of crystal lattices into semicryst. liquids is considered.

J. J. B.

Lattice perturbations, particle size, and heat content of pyrophoric iron. R. FRICKE, O. LOHRMANN, and W. WOLF (Z. physikal. Chem., 1937, B, 37, 60—74).—Reduction with H₂ at 350° of hydrated Fe₂O₃ having an "amorphous" X-ray diagram gave pyrophoric Fe, whilst the product of reduction at 640° was not pyrophoric. The heat of dissolution in 23% H₂SO₄ showed the heat content, H , of the pyrophoric form to be the higher by 1.4 kg.-cal. per g.-atom. The mean particle size of the pyrophoric was < that of the non-pyrophoric form, but not so much smaller that the difference of H could be attributed to difference in surface energy. In pyrophoric Fe, however, there were numerous irregular lattice perturbations, the mean distance of the Fe atoms from the normal position being 0.06 Å., whilst in the non-pyrophoric Fe there were none, and this difference was calc. to result in a divergence in the vals. of H approx. equal to the above.

R. C.

Cathode precipitates formed at high current density. K. N. IVANOV and O. K. KUDRA (J. Phys. Chem. Russ., 1935, 6, 469—477).—X-Ray investigation of powder-like cathode ppts. of Cu, Zn, Cd, s s (A., I.)

and Ag obtained from aq. solutions at high c.d. show them to be disperse and to contain O. The lattice parameters of Cu, Cd, Cu₂O, and ZnO in such ppts. were increased up to 100% owing to absorption of H. Zn and Ag gave normal parameters. CH. ABS. (c)

Spiriform morphology of some lead crystal growths in silica gel. N. STUART (Nature, 1937, 140, 589).—Right-handed and left-handed spiral growths of Pb can be obtained from Pb(OAc)₂ and Sn in SiO₂ gel. The type of growth is very sensitive to the concn. of the reactants.

L. S. T.

Crystal structure of the compounds of the rare earths with the metalloids of the fifth group.

III. Arsenides and antimonides of lanthanum, cerium, and praseodymium. A. IANDELLI and E. BOTTI (Atti R. Accad. Lincei, 1937, [vi], 25, 498—502; cf. A., 1937, I, 401).—X-Ray measurements show that LaAs, CeAs, PrAs, LaSb, CeSb, and PrSb have a face-centred cubic lattice, with a 6.125, 6.060, 5.997, 6.475, 6.399, 6.353 Å., respectively.

O. J. W.

Crystal structure of hydrogen peroxide. F. FÉHER and F. KLÖTZER (Z. Elektrochem., 1937 43, 822—826; cf. A., 1936, 143).—The tetragonal symmetry of H₂O₂ with a 4.02, c 8.02 Å. is confirmed by measurements on single crystals. The Laue symmetry is class D_{4h} . The possible space-groupings are discussed.

J. W. S.

Free two-dimensional crystals of silicon pentoxide. N. A. SCHISCHAKOV (Phil. Mag., 1937, [vii], 24, 687—695).—The existence of nearly identical electron diffraction patterns for pumice, vitreous SiO₂, puzzuolanas, and kaolins is attributed to the presence of two-dimensional Si₂O₅ crystals. K. S.

Fibrous arrangement of micro-crystals of silver chloride. S. SHIMADZU (Mem. Coll. Sci. Kyoto, 1937, 20, A, 179—183; cf. A., 1937, I, 553).—Fibrous crystals are formed on the surface of a AgCl plate dipped in HOCl for 50 hr. The fibre axis is [331], oriented perpendicular to the surface of the plate.

F. J. L.

Fibrous arrangements of the micro-crystals of some substances. N. MATSUMATO (Mem. Coll. Sci. Kyoto, 1937, 20, A, 147—151).—Fibrous crystals of K₂CrO₄, Na₂SO₄, KBr, MgSO₄, and potato starch are obtained on slow evaporation from stretched rayon threads saturated with an aq. solution of the substance. The micro-crystals are formed in the interstices with a principal axis parallel to the fibre axis.

F. J. L.

Crystallochemistry of nitrates of univalent cations. II. C. FINBAK and O. HASSEL (Z. physikal. Chem., 1937, B, 37, 75—80; cf. A., 1937, I, 401).—By rapidly cooling dry KNO₃ from 140° to 110—115° a metastable form having the calcite lattice and a rhombohedral unit cell with a 6.835 Å., α 46° 48', is obtained. By rotation of the NO₃⁻ ions of the low-temp. form about their trigonal axis the stable high-temp. form of KNO₃ results. X-Ray cameras suitable for high and low temp. are described.

R. C.

X-Ray investigation of the structure of cobalt and nickel bromate hexahydrates. C. BELDER-

BOS (Natuurwetensch. Tijds., 1937, 19, 189—196).—The unit cells of $\text{Co}(\text{BrO}_3)_2 \cdot 6\text{H}_2\text{O}$ and $\text{Ni}(\text{BrO}_3)_2 \cdot 6\text{H}_2\text{O}$ contain four mols. The corresponding space-group is T_h^1 with the following parameters determined for Co, Ni, and Br atoms: $d_{100} = [\text{Co}(\text{BrO}_3)_2] 10.320 \pm 0.005 \text{ \AA.}$, $[\text{Ni}(\text{BrO}_3)_2] 10.272 \pm 0.002 \text{ \AA.}$ S. C.

Crystal structure of ammonium, potassium, rubidium, and caesium stannibromides. J. A. A. KETELAAR, (FRL.) A. A. RIETDIJK, and (FRL.) C. H. VAN STAVEREN (Rec. trav. chim., 1937, 56, 907—908).—Powder diagrams obtained with $\text{Cu K}\alpha$ radiation show that the crystal structures of $(\text{NH}_4)_2\text{SnBr}_6$, K_2SnBr_6 , Rb_2SnBr_6 , and Cs_2SnBr_6 are of the K_2PtCl_6 type with a 10.57, 10.48, 10.58, and 10.77 \AA. , respectively. The unit cell contains 4 mols. The Sn—Br distance is 2.60 \AA. , in accord with theory. J. W. S.

Structure of some crystal antimonates. J. BEINTEMA (Rec. trav. chim., 1937, 56, 931—967; cf. A., 1936, 143, 669, 783).—X-Ray investigations show that $\text{Na}_2\text{H}_2\text{SbO}_7 \cdot 5\text{H}_2\text{O}$, $\text{Mg}(\text{SbO}_3)_2 \cdot 12\text{H}_2\text{O}$, $\text{Ni}(\text{SbO}_3)_2 \cdot 12\text{H}_2\text{O}$, $\text{Ba}(\text{SbO}_3)_2 \cdot 8\text{H}_2\text{O}$, and $[\text{Cu}(\text{NH}_3)_3(\text{H}_2\text{O})_3](\text{SbO}_3)_2 \cdot 6\text{H}_2\text{O}$ (I) all contain Sb with co-ordination no. 6. (I) shows a structure somewhat similar to the alternating structure of CdBr_2 (A., 1934, 16). The term "intratasy" is suggested for this phenomenon, which is also shown by the triclinic forms of $\text{Mg}(\text{SbO}_3)_2 \cdot 12\text{H}_2\text{O}$ and $\text{Co}(\text{SbO}_3)_2 \cdot 12\text{H}_2\text{O}$. J. W. S.

Lattice constants and space-group of durangite. P. KOKKOROS (Naturwiss., 1937, 25, 717).—X-Ray spectroscopic investigations give a 6.53 ± 0.01 , b 8.46 ± 0.01 , c $7.00 \pm 0.02 \text{ \AA.}$, β 115° , 4 mols. in unit cell, for durangite, $\text{NaAlF}(\text{AsO}_4)$. The structure is very similar to that of titanite, $\text{CaTiO}(\text{SiO}_4)$. A. J. M.

Space lattice and "superlattice" of pyrrhotite. S. S. SIDHU and V. HICKS (Physical Rev., 1937, [ii], 52, 667).—Powder diffraction spectra confirm the presence of a "superlattice" in paramagnetic and in natural and synthetic ferromagnetic pyrrhotites. Data obtained from single crystals do not support the existence of a "superlattice." N. M. B.

Constitution of diethylmonobromogold and di-*n*-propylmonocyanogold. A. BURAWOY, C. S. GIBSON, G. C. HAMPSON, and H. M. POWELL (J.C.S., 1937, 1690—1693).—Although symmetrical diethylmonobromogold (I) and di-*n*-propylmonocyanogold in CCl_4 have dipole moments of 1.32 and 1.47 D., respectively, crystallographic examination of (I) indicates that the atoms and groups attached to a tervalent and quadricovalent Au atom are coplanar with the Au. W. R. A.

Basic lead acetates.—See A., II, 440.

Grating space of barium-copper stearate films. C. HOLLEY and S. BERNSTEIN (Physical Rev., 1937, [ii], 52, 525).—Results of X-ray and optical measurements are not in agreement. N. M. B.

Crystal structure of *p*-dichlorobenzene at different temperatures. S. C. SIKKAR and J. GUPTA (Indian J. Physics, 1937, 11, 283—288). Laue photographs of $p\text{-C}_6\text{H}_4\text{Cl}_2$ at 37° and 20° are

identical, and afford no evidence of the α - β transformation of Vuks (A., 1937, I, 219). F. J. L.

Crystallographic constants [of substituted phenols]. M. G. GILTA (Bull. Soc. chim. Belg., 1937, 46, 275—282).—Measurements are given (cf. following abstract) for *p*-phenetidine hydrochloride, *p*-carbamidophenetole, 3:4-dihydroxyphenylacetyl chloride, *p*-carbamidophenylarsinic acid, SePh_2Cl_2 , SePh_2Br_2 , and SnPh_2 tartrate. I. McA.

Crystalline form of "tryparsamide" and of related compounds. M. G. GILTA (Bull. Soc. chim. Belg., 1937, 46, 263—274).—By optical examination, crystallographic consts. including system, elements, habit, and interfacial angles are recorded for phenylglycine-4-arsinic acid, its trihydrate and Me ester, and for carbamylphenylglycine-4-arsinic acid and its Li, Na, K ($+3\text{H}_2\text{O}$), Rb ($+3\text{H}_2\text{O}$), and NH_4 salts. Crystals are rhombic or monoclinic. I. McA.

Structure of organic molecular compounds. J. S. ANDERSON (Nature, 1937, 140, 583—584).—Vals. of α , β , and γ , and the space-groups, as determined by X-ray analysis, are recorded for quinhydrone and six related compounds. Structural characteristics revealed by the data are discussed. L. S. T.

Structure of insulin. D. M. WRINCH (Trans. Faraday Soc., 1937, 33, 1368—1380; cf. A., 1937, III, 362).—A structure is proposed for the mol. of insulin, consisting of a portion of the cyclol fabric bent around to enclose a portion of space. The dimensions of the mol. are correlated with X-ray data. H. J. E.

Diffraction of X-rays by built-up films of proteins. G. L. CLARK and S. ROSS (Science, 1937, 86, 292—293).—The diffraction obtained from 30, 40, or 70 layers of egg-albumin corresponds with a spacing of 73.3 \AA. No side-chain spacing of approx. 10 \AA. could be detected. A long spacing of the order found is in accord with the polymerised cyclol theory of protein structure. L. S. T.

Change of lattice constants of fibroin by perfect drying. Y. MATSUNAGA (Mem. Coll. Sci. Kyoto, 1937, 20, A, 157—171).—The lattice consts. of wet silk fibroin are a 9.68, b 7.00, c 8.80 \AA. , β $75^\circ 50'$, and of fibroin dried in vac. for several hr., a 9.19, b 6.63, c 8.56 \AA. , β $76^\circ 43'$. Wetting causes inter- and intra-mol. swelling, one mol. of H_2O entering the lattice (removed by intensive drying). Measurement of the density of fibroin indicates that the width of the intermicellar spaces is $<10 \text{ \AA.}$ F. J. L.

Highly polymerised compounds. CLXXIV. Rotating goniometer fibre diagram. Polymorphism of native cellulose and cellulose hydrate. I. E. SAUTER (Z. physikal. Chem., 1937, B, 37, 161—167).—The rotating goniometer, the advantages of which are discussed, has been used to determine the intensities of the diatropic reflexions of native cellulose and cellulose hydrate. The results support Sponsler and Dore's theory of the structure of cellulose (A., 1928, 939), rather than that of Meyer and Mark. R. C.

Electronic analysis : oxidation of Au-Cu alloys. J. TRILLAT, S. OKETANI, and S. MIYAKÉ (J. Phys. Radium, 1937, [vii], 8, 353—354).—"Diagram O," obtained by electron diffraction from Au foil containing Cu on heating in air (cf. A., 1937, I, 289), is due to a form of CuO stable at the temp. employed.

A. J. E. W.

Strain in galena crystals produced by abrasion. L. H. GERMER (Physical Rev., 1936, [ii], 49, 885).—The abraded surface obtained by filing or grinding a galena crystal gives an electron diffraction pattern consisting of Debye-Scherrer rings of PbS. Light etching in aqua regia changes the surface so that it gives a complex diffraction pattern consisting of two superposed patterns arising from different parts of the surface. The parts from which large blocks are torn by grinding or filing give the pattern of an almost perfect crystal, whilst other areas give a pattern characteristic of a mass of minute crystallites. This layer of rotated crystallites extends 0.003 mm. below the surface, after which the crystal is nearly perfect.

L. S. T.

Structure of Langmuir-Blodgett films of stearic acid. L. H. GERMER and K. H. STORKS (Proc. Nat. Acad. Sci., 1937, 23, 390—397).—Multiple films of stearic acid, prepared by the Blodgett method (A., 1935, 931), and examined by electron diffraction, give clear indications of cryst. structure (monoclinic; a 9.4, b 5.0 Å, β 57°; c , undetermined). Comparison is made between these vals. and those obtained by other methods (cf. Müller, A., 1927, 503).

F. A. A.

Saturation magnetisation and approximation law of iron. W. STEINHAUS, A. KUSSMANN, and E. SCHOEN (Physikal. Z., 1937, 38, 777—785).—The saturation magnetisation of various specimens of polycryst. Fe, and Fe alloys (with Ni, Cr, Cu, and Al), and the effect on it of cold-working and heat-treatment, have been determined. The form of the approximation law is different in different ranges of field-strength. At about 2% < saturation, $I = 1 - (\text{const.}/H^2)$; at higher intensities, $I = 1 - (\text{const.}/H)$. Assuming the accuracy of the second formula, the sp. saturation of pure Fe at room temp. is 217.98 ± 0.1 .

A. J. M.

Optical constants of liquid gallium. J. B. NATHANSON (Physical Rev., 1936, [ii], 49, 887).—For λ of 4358, 5461, and 6708 Å. the coeffs. of absorption are 7.3, 5.9, 5.4, respectively, and n (relative to air) 0.58, 0.88, and 1.10, respectively. Reflecting powers for normal incidence vary only slightly with λ , being 88.7, 88.3, and 88.5, respectively. A variation in temp. from 24° to 40° had no effect.

L. S. T.

Elastic constants of crystalline sodium at 80° K. S. L. QUIMBY and S. SIEGEL (Physical Rev., 1937, [ii], 52, 665).—High-precision data are reported; $s_{11} = 4.86$, $s_{12} = -2.17$, and $s_{44} = 1.76$, all $\times 10^{-11}$ dynes per sq. cm.

N. M. B.

Mechanism of compression and recrystallisation in zinc. M. ŚMIAŁOWSKI (Z. Metallk., 1937, 29, 199—202).—Compression tests on cubes cut from Zn single crystals show that deformability is greatest

in the [0001] direction with loads up to 5 kg. per sq. mm. owing to copious twinning; with greater loads work-hardening is rapid. When the load is applied in the [1010] or [1120] directions compression is slow until the load exceeds 24 or 13 kg. per sq. mm., respectively, after which a small increase in load produces a relatively great reduction in height of the cube. Grain-growth of Zn compressed in the [0001] direction proceeds very rapidly at 260—280°, whereas in Zn compressed in either of the other two directions it occurs only in the vicinity of distorted slip planes below 260° and above 260° proceeds throughout the specimen until very large grains are formed.

A. R. P.

Influence of difference of orientation of two crystals on the mechanical effect of their boundary. B. CHALMERS (Proc. Roy. Soc., 1937, A, 162, 119—127).—Specimens of Sn consisting of two crystals with a longitudinal boundary are tested in tension. The orientation of the crystals is such that the direction of stress is the same in each. The tension required to produce a certain small deformation is found to vary with the relative orientation of the pair of crystals in a specimen. It is concluded that the boundary has no inherent strength and the results are explained as the effect of a transitional lattice. The evidence is against the existence of an amorphous layer or an intercryst. cement at the boundary.

G. D. P.

Investigation of thermal behaviour of alkaline-earth carbonates by emanation method. I. Monotropic transformation of calcium carbonate. II. Enantiotropic transformations of barium and strontium carbonates. K. E. ZIMMENS (Z. physikal. Chem., 1937, B, 37, 231—240, 241—259).—I. A detailed account of work the principal results of which have already been published (A., 1937, I, 403).

II. The graphs of emanating power (E) against temp. (θ) for samples of CaCO_3 and SrCO_3 containing Th-X all have two peaks corresponding with enantiotropic transformation and dissociation but otherwise their form is considerably influenced by variations in particle size and by impurities. The temp. at which lattice loosening causes an increase in E varies with the particle size. Rhombic SrCO_3 undergoes enantiotropic transformation into the hexagonal form at $925 \pm 10^\circ$ and dissociates at $1260 \pm 10^\circ$. In certain cases $E-\theta$ curves may give information about the state and behaviour of solids which is not otherwise obtainable.

R. C.

Magnetism and chemical constitution. R. F. ROBEY and W. M. DIX (J. Chem. Educ., 1937, 14, 414—423).—A review.

L. S. T.

Variation of the diamagnetism of water with temperature. S. SEELY (Physical Rev., 1937, [ii], 52, 662).—Measurements with a manometric balance (cf. A., 1936, 931) over the range 2—74° indicate a continuous irregular increase of susceptibility with temp. with a marked change at 45°. Honda's equation is discussed (cf. A., 1937, I, 404).

N. M. B.

Diamagnetism of heavy water. O. SPECCHIA and G. DASCOLA (Nuovo Cim., 1935, 12, 606—609).— χ for D_2O at 20°, determined by Quincke's method, is

0.732×10^{-6} , and is slightly $<$ the val. for H_2O . χ decreases with increasing temp. ($5-40^\circ$).

CH. ABS. (e)

Magnetism and polymorphism of internally complex salts; iron salts of dithiocarbamic acids. L. CAMBI and L. MALATESTA (Ber., 1937, 70, [B], 2067—2078; cf. A., 1933, 556).—Röntgen investigation shows that the majority of Fe dithiocarbamates are isomorphous with the typically diamagnetic Co dithiocarbamates. Fe *NN*-dipropyl-, *NN*-diisobutyl-, and *NN*-diisoamyl-dithiocarbamates have practically the same susceptibility in the cryst. condition, in solid solution with the corresponding Co salt, and in certain liquid solvents, showing thus that χ_A depends mainly on the intramol. field. In other cases polymorphism is apparent. The val. of χ_A for the form (I) of Fe^{III} *NN*-dibutyldithiocarbamate obtained by crystallisation at room temp. is $<$ that of the variety (II) obtained by re-solidification of the salt after being melted. The forms exhibit so little symmetry that their cryst. structure cannot be deduced but (I) is isomorphous with the corresponding Co salt which separates from all solvents; (II) is not thus isomorphous. (II), stable at higher temp., is probably metastable at lower temp. The paramagnetic behaviour of (I) appears independent of the cryst. state since practically identical vals. of χ_A are observed in C_6H_6 or CHCl_3 at the same temp. A similar example is found in Fe^{III} *N*-butyl-*N*-isobutyldithiocarbamate; only the variety with greater paramagnetism has been obtained with certainty in the cryst. condition. It is a typical Fe^{III} salt and the more stable of the two varieties.

H. W.

Diamagnetism of superconducting bodies. G. C. WICK (Physical Rev., 1937, [ii], 52, 526; cf. London, A., 1937, I, 292).—A simple interpretation of the Meissner effect is given.

N. M. B.

Thermomagnetic study of two paramagnetic solutions. A. NICOLAU (Compt. rend., 1937, 205, 557—558).—Aq. solutions of NiSO_4 and $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ have been studied in the temp. range $20-85^\circ$; vals. of χ for Ni^{++} and Fe^{++} are given, and conform to Weiss' law. The deduced vals. of M are for Ni^{++} 16.6, and for Fe^{++} 25.5 Weiss magnetons. A break in the $1/\chi-I$ curve for Fe^{++} occurs at 66° , above which M is $<$ the above val.

A. J. E. W.

Electrical and optical properties of semi-conductors. XIV. Magnetic measurements on cuprous oxide. F. HOMMEL (Ann. Physik, 1937, [v], 30, 467—480).—The CuO lattice cannot be detected in O-rich Cu_2O by means of Debye-Scherrer patterns, which are sensitive to 1.5% CuO in Cu_2O . The magnetic susceptibility of Cu_2O has been measured from room to liquid air temp. Vals. depend on previous treatment of the specimen. Pure Cu_2O is diamagnetic, $\chi = -0.2 \times 10^{-6}$. The paramagnetic part of the magnetism is increased by heating in O_2 and decreased by heating in vac. On cooling the paramagnetic part increases in O-poor and decreases in O-rich specimens. There is no simple relationship between χ and the resistance of Cu_2O specimens. The absence of Fe in the Cu_2O used was proved by a magnetic method.

O. D. S.

Rules of magnetic binding. Stereomagnetism. O. VON AUWERS (Wiss. Veroff. Siemens-Werken, 1937, 16, 92—116).—The magnetism of metallic elements, and its variation with the position of the element in the periodic system, is discussed. Such elements can be classified into three groups: (a) univalent metals, and metals of *B* sub-groups, (b) transition metals, and (c) rare-earth metals. Binary alloys are considered under three types: (a) dil. solutions of non-ferromagnetic metals in ferromagnetic lattices, (b) dil. solutions of ferromagnetic metals in diamagnetic lattices, and (c) conc. solutions of ferromagnetic metals in ferromagnetic lattices. Metals and alloys having diamagnetism or Langevin-paramagnetism are those in which there is no interaction between the lattice constituents. Those having metallic paramagnetism ("anti-ferromagnetism") and ferromagnetism are those with interaction. Anti-parallel impulse coupling gives anti-ferromagnetism; parallel impulse coupling produces ferromagnetism. The type occurring is governed by rules which represent an extension of Hund's rules of homopolar binding.

A. J. M.

Superconductivity in aromatic compounds.

F. LONDON (J. Chem. Physics, 1937, 5, 837—838).—By means of an equation (i) derived from the extension of the "mol. orbital theory" to the case of the presence of a magnetic field, vals. of the magnetic anisotropies of C_{10}H_8 , anthracene, phenanthrene, pyrene, and Ph_2 have been calc. on the basis that the anisotropy of C_6H_6 is 1, and agree with experimental vals. The method used by Pauling to calculate the diamagnetic anisotropies of aromatic compounds is represented as showing that the aromatic compounds behave as superconductors and an equation (ii) is given. Vals. obtained from equation (ii) do not agree with (i), and the application of the corrections suggested by Pauling are held to be incompatible with the exactness of the theoretical calculations and with the accuracy of the experimental measurements.

W. R. A.

Discontinuity in the thermoelectric power of rhodium. E. T. BOOTH and E. H. DIXON (Rev. Sci. Instr., 1937, [ii], 8, 381—382; cf. A., 1931, 277).—An investigation of the temp.-e.m.f. relations of a Pt-Rh thermocouple in the range $850-1350^\circ$ supports the view that Rh undergoes a change of structure at 1091° .

N. M. B.

Derivation of the latent heat equation from the principles of dilute solutions. B. N. BISWAS (Indian J. Physics, 1937, 11, 239—250).—Theoretical.

F. J. L.

Phase equilibria in hydrocarbon systems. XIX. Thermodynamic properties of *n*-butane. B. H. SAGE, D. C. WEBSTER, and W. N. LACEY (Ind. Eng. Chem., 1937, 29, 1188—1194; cf. A., 1935, 149; 1936, 930; B., 1936, 866).—From measurements of sp. vol. as a function of pressure and temp. and published data on the isobaric sp. heat of the saturated liquid and gas, the vals. of \bar{H} , \bar{S} , and fugacity at temp. between 70° and 250°F. , and pressures between atm. and 3000 lb. per sq. in., have been calc. and are recorded in tables and graphs.

R. C. M.

Rapid and approximate calculation of the specific heats of liquids. P. GUARESCHI (Atti R. Accad. Lincei, 1937, [vi], 25, 481—484).—The sp. heat at const. vol. of a liquid is given approx. by $C_v = k/\alpha M$, where k is the mean Trouton-Hildebrand const., α is the association coeff., M = mol. wt. k can be interpreted as a mol. sp. heat. O. J. W.

Relationship between the form of the functions $T = f(M)$ and $n = f(M)$ and the number of members. V. K. NIKIFOROV (J. Phys. Chem. Russ., 1937, 9, 449—453).—The average b.p. of org. compounds having mol. wt. $M \pm 10$ is $T = 38\sqrt{M}$. The no. of known org. compounds within the range between $M - 10$ and $M + 10$ is max. when $M = 150$. J. J. B.

Most probable b.p. of chemical compounds. V. K. NIKIFOROV and M. M. SOKOLOV (J. Phys. Chem. Russ., 1937, 9, 454—460).—The probability for an org. compound of the mol. wt. M to have a b.p. T is discussed. $T \propto \sqrt{M}$. J. J. B.

Method for deriving expressions for the first partial derivatives of thermodynamic functions. P. LERMAN (J. Chem. Physics, 1937, 5, 792—794).—Mathematical. Any first partial derivative of the thermodynamic functions may be resolved into terms of temp., vol., pressure, entropy, and six basic forms of a mathematical quantity called a "vired." These basic vireds have been expressed in terms of better known and more easily determined thermodynamic quantities, increment of work done by the system, increment of heat absorbed by the system, internal energy of the system, heat content, Helmholtz free energy, and Gibbs free energy. Operating rules are given. W. R. A.

Critical temperature and orthobaric densities of diphenyl ether and naphthalene. D. T. SHURAVLEV (J. Phys. Chem. Russ., 1937, 9, 875—882).—The crit. temp. of Ph_2O is 494° , that of C_{10}H_8 476.5° . Orthobaric densities are determined in the intervals 30 — 494° for Ph_2O and 80 — 476.5° for C_{10}H_8 . The equations of the rectilinear diameters are $0.5440 - 4.3 \times 10^{-4}t - 4.1 \times 10^{-8}t^2$, and $0.5197 - 3.737 \times 10^{-4}t - 1.18 \times 10^{-7}t^2$. The density of liquid Ph_2O is $d = 1.0880 - 0.00086t$. Consts. of the Ferguson-Miller density formula are calc. E. R.

Fluorine at low temperatures. II. Vapour pressure of fluorine. S. AOYAMA and E. KANDA (Bull. Chem. Soc. Japan, 1937, 12, 416—419; cf. A., 1937, I, 629).—The v.p. of F_2 has been measured between -187° and -213° . The b.p. is -188° , heat of vaporisation 1581 g.-cal., heat of evaporation of solid 1970 g.-cal. F. J. L.

Thermal properties of vinyl bromide. A. GUYER, H. SCHÜTZE, and M. WEIDENMANN (Helv. Chim. Acta, 1937, 20, 936—949).—The v.p. of $\text{CH}_2\text{:CHBr}$ between -80° and 50° follows approx. $\log p = -1281/T + 7.322$. d has been determined over the temp. range -40° to 30° . The deviations of the vapours from the ideal gas laws have been determined for 20 — 50° . The heat of vaporisation is calc. for the range -40° to 50° . J. W. S.

Rate of evaporation of small water drops. T. NAMEKAWA and T. TAKAHASHI (Mem. Coll. Sci. Kyoto, 1937, 20, A, 139—146).—Equations for determining the rate of evaporation of small H_2O drops in still and moving air are deduced, and verified experimentally. F. J. L.

Evaporation coefficient of water and two methods for its determination. H. MACHE (Z. Physik, 1937, 107, 310—321).—The evaporation coeff. of H_2O , defined as the rate of lowering of a quiescent meniscus of H_2O per mm. difference in pressure at the liquid-gas interface, is measured in two ways: (i) the H_2O vapour from an enclosed hot surface is collected and weighed, and (ii) the fall in height of a column of H_2O in a narrow tube is observed micrometrically. Deviations from Stefan's law (method ii) lead to the val. 5.5×10^{-6} cm. per sec. per mm. L. G. G.

Theory of motion of anomalous liquids. A. K. SKRJABIN (J. Phys. Chem. Russ., 1937, 9, 901—916).—Mathematical theory of the plastic-viscous flow (with gliding) of anomalous liquids. E. R.

Vapour-liquid equilibria of methyleyclohexane-toluene mixtures. (MISS) D. QUIGGLE and M. R. FENSKE (J. Amer. Chem. Soc., 1937, 59, 1829—1832).— d_4^{25} , n_D , and b.p. (760 mm.) data are recorded for the mixtures; the relation between the composition of the liquid and vapour has also been examined. The mixture is suitable for testing the efficiency of fractional distillation apparatus. J. W. S.

Study of non-aqueous solutions by methods of physico-chemical analysis. M. A. KLOTSCHKO (Bull. Acad. Sci. U.R.S.S., Sér. Chim., 1937, 641—673).—The compound $\text{AlBr}_3 \cdot \text{PhNO}_2$ is suggested by max. or min. on the conductivity-, η -, and d -composition curves, at 5 — 100° . It decomposes with formation of non-conducting products at higher temp. R. T.

Equilibrium diagram of the system aluminium-lithium. F. I. SCHAMRAI and P. J. SALDAU (Bull. Acad. Sci. U.R.S.S., Sér. Chim., 1937, 631—640).—The compounds AlLi and AlLi_2 are confirmed; the formation of two layers in alloys containing 40—60 at.-% Li (cf. Grabe *et al.*, A., 1936, 151) is denied. The eutectic, m.p. 170.6° , between the γ - and δ -phases contains 94 at.-% Li. R. T.

X-Ray investigation of the system aluminium-beryllium. E. S. MAKAROV and L. TARSCHISCH (J. Phys. Chem. Russ., 1937, 9, 350—358).—Solid Al at 610° dissolves 0.14 wt.-% of Be. α -Be dissolves <0.9 wt.-% of Al. The existence of β -Be is confirmed. J. J. B.

Physico-chemical properties of aluminium-silver alloys containing much aluminium. F. E. TISCHTSCHENKO and I. K. LUKASCH (J. Phys. Chem. Russ., 1937, 9, 605—610; cf. A., 1937, I, 608).—Dilatation in the formation of the alloys is a max. at 11.8 wt.-% of Ag; it is negative at 11% and 31% of Ag. Corrosion in tap- H_2O and aq. KOH is max. at 11.8% of Ag, whilst the hardness at this concn. shows a slight min. Presumably the size of AgAl_2 crystals is min. at this concn. J. J. B.

Structure of aluminium-silver alloys. F. E. TISCHTSCHENKO and I. K. LUKASCH (J. Phys. Chem. Russ., 1937, 9, 440—448).—Thermal and micrographical data are recorded for alloys with 0—80% Ag. Al is in equilibrium with AgAl_2 ; the saturated solution contains 46.5 wt.-% Ag at 558° (eutectic point), 11.8% at 440°, and about 1% at 20°. A transformation occurs at 440°, and this is said to be due to the recrystallisation of the Al-AgAl_2 solution.

J. J. B.

Nature of the iron-manganese alloys. F. M. WALTERS (Met. Prog., 1937, 32, 254—255).—The Fe-Ni and Fe-Mn diagrams are compared.

R. B. C.

New phase in the iron-zinc system. J. SCHRAMM (Z. Metallk., 1937, 29, 222—224).—A phase with 6—6.5% Fe has been detected by thermal, magnetic, X-ray, and micrographic methods in all alloys with <6% Fe below 419° and in alloys with 6—7% Fe below 530°; it is formed by a peritectic reaction at 530° and can be detected by etching with a strongly alkaline Cu cyanide solution, which colours it red to black by deposition of Cu.

A. R. P.

Structure of magnesium-rich magnesium-calcium alloys. H. VOSSKÜHLER (Z. Metallk., 1937, 29, 236—237).—Up to 60% Ca only one compound, Mg_2Ca , m.p. 714°, has been detected; this forms a eutectic with Mg at 516° (16.3% Ca) and with Ca at 445°. Mg dissolves 0.18% Ca at 300°, 0.29% at 400°, 0.66% at 500°, and 0.78% at 516°.

Diagram of state and transformations occurring in the decomposition of the α solid solution in the copper-tin alloys. S. T. KONOBEEVSKI and V. P. TARASOVA (J. Phys. Chem. Russ., 1937, 9, 681—692).—The relation of the α -phase to $\alpha + \gamma$ and $\alpha + \epsilon$ has been determined by X-ray analysis. An intermediate phase ϵ' has been found; it is formed in the transformation $\gamma \rightarrow \epsilon$ and separates from the α -solid solution above 380°; its lattice corresponds with a rhombic cell containing 32 atoms.

E. R.

Constitution of the copper-gallium alloys in the region 18—32 at.-% gallium. W. HUME-ROTHERY and G. V. RAYNOR (J. Inst. Met., 1937, 61, Advance copy, 419—436).—The peritectic horizontal $\alpha + \text{liquid}$ β is at 915.1° and the liquid contains 21.5 at.-% Ga; the $\beta + \text{liquid}$ γ peritectic is at 835.9° and the solidus of the β -phase is almost a straight line joining 19.5 at.-% Ga on the first to 27.5 at.-% Ga on the second peritectic horizontal. The β range rapidly decreases with fall in temp. until a eutectoid point is reached at 618°, 23.7 at.-% Ga corresponding with the transformation $\beta \rightarrow \beta' + \gamma$. The pure β' phase exists over a narrow range of composition around 22.3 at.-% Ga and decomposes at 475° to form $\beta'' + \gamma$, β'' having a narrow homogeneous range around 21.5 at.-% Ga and appearing to decompose on annealing for several weeks at 380—400° with the formation of a fourth modification of

A. R. P.

Cadmium-indium alloy system. C. L. WILSON and O. J. WICK (Ind. Eng. Chem., 1937, 29, 1164—1166).—Thermal analysis and electrical resistivity measurements show that no compounds are formed.

In and Cd are completely miscible in the liquid state; a eutectic (m.p. 122.5°) is formed at 75% In. Solid solutions of Cd in In (15% at room temp.) are formed, but solid Cd dissolves little or no In.

E. S. H.

Platinum-molybdenum alloys. V. A. NEMILOV and N. M. VORONOV (Ann. Sect. Platine, 1937, 14, 157—162).—Hardness, conductivity, and thermal e.m.f. data for alloys containing 0—60% Mo indicate the existence of a series of solid solutions. This view is confirmed by a study of the micro-structure.

R. T.

Transformation in the β -brasses. C. SYKES and H. WILKINSON (J. Inst. Met., 1937, 61, Advance copy, 401—418).—The sp. heat-temp. curve of α -brass shows an anomaly at 200° but is linear at higher temp.; the curve for $\alpha + \beta$ brasses still shows this anomaly, but the intensity decreases with increasing proportion of β , and above 200° the curve rises steeply to a max. at 456°, the intensity of which becomes much greater as pure β is approached. The shape of the curve for pure β -brass is not appreciably affected by quenching. The graph showing the difference in energy content between 240° and 500° consists of a series of straight lines intersecting at the phase boundaries at 450°; the Zn contents corresponding with these are $\alpha/(\alpha + \beta)$ 38.3, $(\alpha + \beta)/\beta$ 45.4, and $\beta/(\beta + \gamma)$ 49.6%, confirming the vals. found by other workers by thermal analysis. For the compound CuZn the energy content difference from 240° to 500° is 37.3 g.-cal. per g., the max. sp. heat 0.27 g.-cal. per g. per °C., and the change in entropy below the crit. temp. 0.0157 g.-cal. per g. compared with a theoretical val. for an order-disorder transformation of 0.0198 g.-cal. per g. according to Bethe's theory which, therefore, is in better agreement with the experimental results than that of Bragg and Williams.

A. R. P.

X-Ray investigations on tin bronzes. II. T. ISAWA (Mem. Ryojun Coll. Eng., 1937, 10, 53—61; cf. A., 1935, 693).—Investigations with a high-temp. camera show at 550° the presence of the α and β phases in alloys containing 20—27% of Sn, and of the δ phase in alloys with 32.5% of Sn. At 600—650° the alloys with >23% of Sn consist entirely of the β phase. There is no eutectoid transformation at 580°, but the transformation is similar to that of β -brass. The changes produced by quenching and annealing have been investigated and the stages $\beta \rightarrow \beta' \rightarrow \alpha + \delta$ established for the annealing process.

E. S. H.

Thermochemistry of alloys. III. Heats of formation of the binary alloys iron-antimony, cobalt-antimony, nickel-antimony, cobalt-tin, copper-tin, and copper-zinc in the cast state. F. KÖRBER and W. OELSEN (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1937, 19, 209—219).—Heats of formation for the complete series of binary alloys are compared with the respective equilibrium diagrams. With Sn alloys the heats of mixture in the liquid state show that there is considerable dissociation of the compounds in the melts. The heats of formation of alloys of Sb or Sn with the ferromagnetic metals increase in the order $\text{Fe} < \text{Co} < \text{Ni}$, as found previously for Al and Si alloys.

E. S. H.

Thermochemistry of alloys. II. Direct determination of heats of formation of the ternary alloys iron-nickel-aluminium, iron-cobalt-aluminium, copper-nickel-aluminium, iron-aluminium-silicon, as well as a series of alloys of the system copper-manganese-aluminium. F. KORBER, W. OELSEN, and H. LICHTENBERG (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1937, 19, 131—159; cf. preceding abstract).—Thermal data for the complete series of ternary alloys are compared with the corresponding equilibrium diagrams and data previously obtained for binary systems of the same components. E. S. H.

Influence of aluminium, titanium, vanadium, copper, zinc, tin, and antimony on the polymorphic transformation of cobalt. W. KOSTER and E. WAGNER (Z. Metallk., 1937, 29, 230—232).—Addition of any of the above metals to Co has a marked influence on the temp. at which the ϵ - γ change takes place and considerably increases the hysteresis effects. The temp. of the γ - ϵ change on cooling is reduced from 420° to 0° by 12% V, 10% Cu, 14% Zn, and 5% Al, to 130° by 5% Sn, to 160° by 7.2% Ti, and to 190° with 8.5% Sb. The temp. of the ϵ - γ change on heating is correspondingly altered to 600°, 380°, 580°, 150°, 380°, 350°, and 530°, respectively. The magnetic transformation in Co at about 1100° is reduced to 780° by 5.2% Al, to 890° by 7.2% Ti, to 1040° by 12% Cu, to 1070° by 9% Sn, and to 990° by 8.5% Sb. Except in the cases of V and Zn these vals. represent the solid solubility of the metals in Co at the temp. indicated. A. R. P.

Influence of beryllium, carbon, and silicon on the polymorphic transformation of cobalt. W. KOSTER and E. SCHMID (Z. Metallk., 1937, 29, 232—233).—Co and Be form a eutectic at 4.2% Be, 1115°; the solubility of Be in Co decreases from 2.5% at this temp. to 1.4% at room temp. The temp. of the magnetic transformation in Co is reduced to 950° by 2.5% Be and that of the γ - ϵ change on cooling to 265° whereas that of the ϵ - γ change on heating is raised to 550° by 1.5% Be. The ϵ - γ change occurs at 390° and the γ - ϵ at 90° with 0.1% C in Co, indicating that this is the solubility limit of C at <600°. Co dissolves 7.8% Si at 20° and 9.5% at 1205° (eutectic temp.); the temp. of the ϵ - γ change in Co rises linearly with increasing Si content, intersecting the solubility line at 1180°, 9.5% Si, while the temp. of the magnetic transformation is linearly reduced, the line intersecting the ϵ - γ line at 800°, 4.7% Si and the solubility line at 580°, 8% Si. A. R. P.

X-Ray determination of the solubility of the α -phase in the ternary system copper-zinc-tin at low temperatures. S. T. KONOBEEVSKI, V. P. TARASOVA, and A. A. STEPANOVA (J. Phys. Chem. Russ., 1937, 9, 693—703).—The transformation of the α -phase on annealing has been studied in relation to previous thermal and mechanical treatment (quenching, slow cooling, deformation). The transformation is accelerated by deformation. E. R.

Magnesium corner of the magnesium-aluminium-cadmium system. W. KOSTER and W. DULLENKOFF (Z. Metallk., 1937, 29, 202—204).—

In alloys of Mg with 5% Cd the solubility of Al is 1.2% at 20°, 4% at 300°, and 13.5% at 420° (eutectic horizontal), and in those containing 10% Cd 0.8% at 20°, 3% at 300°, and 11% at 420°. The solid solution range extends at 420° to 16% Al + Cd with a 1:2 Al-Cd ratio and to 28% with a 2:1 ratio. Alloys with >6% Al and 5—10% Cd can be pptn.-hardened by quenching from 420° and reheating at 200—300°, max. Brinell hardness of 80 being obtained with 13% Al and 5% Cd. A. R. P.

Solid solution series magnesium-AgCd₃ in the ternary system magnesium-silver-cadmium. F. LAVES and K. MOELLER (Z. Metallk., 1937, 29, 185—189).—Mg forms a continuous series of solid solutions with the hexagonal compound AgCd₃, the liquidus consisting of two almost straight lines meeting at 420°, 50 at.-% Mg, showing that an intermetallic compound which obeys Hume-Rothery's rule can readily form a solid solution series with a pure metal of similar lattice structure. In alloys with 35—70 at.-% Mg a transformation occurs at 194—271° according to the Mg content; this curve likewise consists of two branches (almost straight lines) with a flat max. at 50 at.-% Mg. The low-temp. modification has a close-packed hexagonal lattice with superstructure, the structure of the 50 at.-% Mg alloy being identical with that of MgCd. A. R. P.

Ternary compound Mg₄Cu₁₁Al₁₁. W. SCHUTZ (Metallwirts., 1937, 16, 949—950).—Evidence is advanced indicating that the ternary cubic compound with α 8.29 A. in the Mg-Cu-Al system is Mg₄Cu₁₁Al₁₁ and not as previously reported (Laves and Witte, A., 1936, 420) Mg₃Cu₇Al₁₀; the new formula is in agreement with the Hume-Rothery rule. A. R. P.

Constitution of tin-rich antimony-cadmium-tin alloys. D. HANSON and W. T. PELL-WALPOLE (J. Inst. Metals, 1937, 61, Advance copy, 443—485).—The system has been studied by thermal and micrographic methods from the Sn corner up to alloys containing Cd 43 and Sb 14% and the results are shown as isothermal diagrams of the various surfaces and as vertical and horizontal sections through the ternary space model. The solubilities in Sn of Sb and Cd are respectively 9 and 1.5% at 227°, 5.5 and 2.4% at 209°, 1 and 0.7% at 148°, and 0.6 and 0.6% at 20°. The β -Cd-Sn phase dissolves 5.1% Sb at 209° and 0.8% at 145°. The liquidus surface shows five surfaces corresponding with the separation of the α , β , γ , δ , and ϵ phases, six grooves corresponding respectively with the reactions $\delta + \text{liquid} = \alpha$, and $\alpha + \text{liquid} = \beta$, and the separation of $\beta + \gamma$, $\epsilon + \delta$, $\beta + \epsilon$, and $\gamma + \epsilon$, and three invariant points corresponding to the ternary reactions: $\text{liquid} + \delta = \alpha + \epsilon$, $\text{liquid} + \alpha = \beta + \epsilon$, and $\text{liquid} + \epsilon = \gamma + \beta$. The peritectic reaction at 246° in the Sb-Sn system takes place at lower temp. on addition of Cd, and that at 223° in the Sn-Cd system is depressed slowly by addition of Sb; the eutectic temp. (176°) in the Cd-Sn system is raised to 180° by addition of Sb but there is no ternary eutectic. There are three peritectic reactions, viz., $\delta + \text{liquid}$ (Cd 10, Sb 8.2%) = $\epsilon + \alpha$ (Cd 1.5, Sb 9%) at 227°, α (Cd 2.4, Sb 5.5%) + liquid (Cd 15.4, Sb 4.3%) = $\beta + \epsilon$ a

209°, and ϵ + liquid (Cd 33, Sb 1%) = β (Cd 7, Sb 2%) + γ (nearly pure Cd). The temp. of the eutectoid decomp. of β is raised by the addition of >0.8% Sb from 133° at the Cd-Sn side to 145°. The α , β , and γ phases are structurally identical with those of the Cd-Sn system, δ is a solid solution of Cd in SbSn, and ϵ the compound CdSb containing a small amount of Sn in solid solution. A. R. P.

Influence of chromium on the γ field of iron-nickel alloys. Transformation diagrams of "irreversible alloys." J. B. FRIDMAN (J. Phys. Chem. Russ., 1937, 9, 502—510).—Cr decreases the γ field in Fe and increases it in Fe + Ni. An explanation is given on the basis of at. vols. (cf. Wever, A., 1929, 745). The temp. of the transformation $\alpha \rightarrow \gamma$ in Fe-Ni-Cr alloys is > that of $\gamma \rightarrow \alpha$; this hysteresis effect is discussed. J. J. B.

Investigation of equilibrium diagrams of ternary alloys by X-rays. A. J. BRADLEY, H. J. GOLDSCHMIDT, H. LIPSON, and A. TAYLOR (Nature, 1937, 140, 543—544).—As an example of the readiness with which such diagrams can be obtained by means of X-ray analysis, a diagram for the system Al-Ni-Cu is reproduced and discussed. The X-ray method gives at the same time the no., nature, and relative amount of phases present, and the lattice spacing of each phase. L. S. T.

Inverse segregation. N. B. VAUGHAN (J. Inst. Met., 1937, 61, Advance copy, 377—399).—Recent work on and theories of the phenomenon are summarised; an extensive bibliography is included. A. R. P.

Solubility of carbon dioxide in water under pressure. J. D. ZELVENSKI (J. Chem. Ind. Russ., 1937, 14, 1250—1257).—The solubility at 0—100° and 1—100 atm. is given by $S = ap + bp^2$, where a and b are consts. at a given temp., and diminish with rising temp. For concns. up to 0.015M- CO_2 S varies according to Henry's law. The differential heat of dissolution of CO_2 is 5870 g.-cal. at 25°/760 mm. A cryst. nona- or deca-hydrate, with dissociation pressure 10.3 atm. at 0°, is obtained by forcing CO_2 into H_2O at 0° and <11 atm. R. T.

Henry's coefficient for a gas dissolved in a liquid with a high vapour pressure. I. R. KRITSCHESKI (J. Phys. Chem. Russ., 1937, 9, 313—316).—Thermodynamic expressions are given for (a) the relation between the concns. of a component in the vapour and liquid phases, and (b) the difference between the partial molal vols. in both phases. J. J. B.

Solubility in liquid ammonia of hydrogen at 0° and of nitrogen at 0°, 50°, 75°, 90°, and 100° at pressures to 1000 atmospheres. Critical phenomena of ammonia-nitrogen mixtures. R. WIEBE and V. L. GADDY (J. Amer. Chem. Soc., 1937, 59, 1984—1987).—The solubility of H_2 in liquid NH_3 has been determined at 0° and 50—1000 atm., and the solubility of N_2 in liquid NH_3 at 0—100° and 50—1000 atm. In the latter system two crit. points exist, at about 90°/600 atm., and about 100°/375 atm., respectively. J. W. S.

Solubilities of hydrocarbons in anhydrous hydrogen fluoride and their modification by added salts. W. KLATT (Z. anorg. Chem., 1937, 234, 189—192).—Saturated hydrocarbons are insol. in anhyd. HF, but those having double linkings are appreciably sol. if they do not undergo polymerisation. Data are given for C_6H_6 , PhMe, anthracene, *m*- and *o*-xylene, and tetrahydronaphthalene at temp. between -20° and 15°. The solubility is increased by addition of $\text{Hg}(\text{CN})_2$, $\text{Hg}(\text{N}_3)_2$, AgN_3 , AgF, and TlF; the increment is in all cases 4 mols. of hydrocarbon per mol. of salt. The hydrocarbons also increase the solubilities of the salts, so that the ratio excess of salt : hydrocarbon is 1 : 4. The solutions are coloured in most cases, and the colour is changed by the heavy-metal salts. This fact may be used to test for impurity in HF. F. J. G.

Solubility of gases in metals under pressure. I. R. KRITSCHESKI (J. Phys. Chem. Russ., 1937, 9, 867—869).—For diat. gases (H_2 , N_2) in metals (e.g., Fe) the solubility $\propto \sqrt{p}$. This suggests that the dissolved gas consists of free atoms. A thermodynamic formula is derived which shows that the \sqrt{p} law ceases to be exact at high pressures. E. R.

Solubility of sodium and potassium chlorides in corresponding hydroxide solutions at 25°. G. ÅKERLOF and O. SHORF (J. Amer. Chem. Soc., 1937, 59, 1912—1915).—The solubility curves of NaCl in aq. NaOH and of KCl in aq. KOH at 25° are in accordance with those calc. from a general solubility equation. The consts. required to calculate the solubility of NaNO_3 in aq. NaOH and of KNO_3 in aq. KOH at 25° are also deduced. J. W. S.

Solubility equilibria of sodium sulphate at temperatures from 150° to 350°. III. Effect of sodium hydroxide and sodium phosphate. W. C. SCHROEDER, A. A. BERK, and A. GABRIEL. IV. Comparison of evaporation and equilibrium solubility values. W. C. SCHROEDER, A. A. BERK, and E. P. PARTRIDGE (J. Amer. Chem. Soc., 1937, 59, 1783—1790, 1790—1795; cf. A., 1935, 1314; 1936, 798).—III. At >120° the solubility (s) of Na_2PO_4 in H_2O decreases rapidly with rising temp. and approaches zero at 350°. At 120—215° the stable solid phase is $\text{Na}_3\text{PO}_4 \cdot \text{H}_2\text{O}$; at >215° it is Na_3PO_4 , and the latter can be prepared by crystallisation at high temp. NaOH (8—20 g. per 100 g. of H_2O) decreases s considerably at 150° and slightly at 250°, but causes a small increase in s at 350°. The system Na_2SO_4 - Na_3PO_4 - H_2O has been studied at 150—350°. At 200° the double salts $\text{Na}_2\text{SO}_4 \cdot 2\text{Na}_3\text{PO}_4$ (I) and $\text{Na}_2\text{SO}_4 \cdot 5\text{Na}_3\text{PO}_4$ are formed. At 250° (I) forms solid solutions with Na_3PO_4 or with other double salts. At 150° and 250° NaOH decreases the solubilities of all the solid phases, but increases them markedly at 350°.

IV. Removal of H_2O vapour from a solution containing Na_2SO_4 alone or in presence of NaOH, NaCl, Na_2CO_3 , or Na_3PO_4 does not cause supersaturation with respect to Na_2SO_4 if the latter is the only solid phase, but supersaturation may occur if the solid phase is a double salt of Na_2SO_4 with Na_2CO_3 or Na_3PO_4 . Na_2SO_4 and NaCl form heavy

scales in the region over which the solubility increases with rising temp. J. W. S.

Solubility of silver permanganate in water and in aqueous solutions of silver nitrate and perchlorate. F. HEIN and W. DANIEL (Z. anorg. Chem., 1937, 234, 155—160).—Small additions of both AgNO_3 and AgClO_4 decrease the solubility of AgMnO_4 , but in more conc. solutions of AgNO_3 the solubility increases again, whereas in AgClO_4 it decreases continuously. In both cases there is a distinct change of colour. F. J. G.

Solubility and dissociation of lead chloride in solutions of potassium nitrate. F. ISHIKAWA and K. MORIKAWA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 915—920).—The solubility of PbCl_2 in aq. KNO_3 solutions has been measured at 25°, and the Debye-Hückel and Hückel equations applied to the results, assuming complete dissociation of PbCl_2 . The latter equation affords a satisfactory interpretation of the results. The dissociation of PbCl_2 in two stages has been theoretically treated. J. W. S.

Preparation, aqueous and perchloric acid solubilities, solution densities, and transition temperature of silver perchlorate. G. F. SMITH and F. RING (J. Amer. Chem. Soc., 1937, 59, 1889—1890).—Redetermination of the solubility of AgClO_4 at 0—35° confirms previous vals. (A., 1922, ii, 555). The transition of $\text{AgClO}_4 \cdot \text{H}_2\text{O}$ to AgClO_4 at 43.0° is also confirmed. Data are recorded for n of saturated aq. solutions at 15—35°, and for the solubility of AgClO_4 in 60—73.6% HClO_4 at 0° and 25°. Solution densities are also recorded. J. W. S.

Separation of calcium fluoride from supersaturated solutions. A. T. JENSEN (Z. physikal. Chem., 1937, 180, 93—116).— CaF_2 separates from supersaturated solutions within a few days only if the solubility product is considerably exceeded. There is first a period of incubation (t) in which little CaF_2 separates, after which the solution becomes turbid and the rate of separation rises rapidly to a max. and falls again slowly. t is practically independent of the p_{H} but decreases rapidly with rise of temp. $\log t$ increases linearly with $\log (1/[\text{Ca}^{++}][\text{F}']^2)$, unless the latter rises below a certain limit, when t increases rapidly and indefinitely. Even in solutions in which Ca^{++} and F' are not present in equiv. concns. t is determined by the val. of the ionic product. The presence of starch increases t . It seems that it is only the CaF_2 mols. with especially high translational energy which are able to form nuclei. Nuclei appear to be formed spontaneously, and during the incubation period the rate of formation is probably const. The rate of growth of the particles of visible dimensions is so small that it cannot possibly be determined by the rates of diffusion of Ca^{++} and F' ions. It seems that a solid salt separates from its supersaturated solution the less readily the harder is the salt. R. C.

Solubility of quartz in hydrogen borofluoride. W. B. HARRIS (J. Ind. Hyg., 1937, 19, 463—464).— SiO_2 particles $<5 \mu$. are about as sol. in HBF_4 as in H_2SiF_6 . J. N. A.

Absorption capacity of silver, rhodium, and tungsten for hydrogen, and stability of gauzes made of their alloys with platinum in ammonia oxidation. I. E. ADADUROV and N. I. PEVNYI (J. Phys. Chem. Russ., 1937, 9, 592—597).—Pt-Ag, Pt-Rh, and Pt-W alloys are less rapidly corroded by NH_3 + air than is Pt alone. In agreement with Adadurov and Prozorovski (cf. B., 1936, 316) Rh and W do not absorb H_2 between 100° and 450°.

J. J. B.
Adsorption studies with radon. W. SIEBERT (Z. physikal. Chem., 1937, 180, 169—184).—In the adsorption on SiO_2 gel at -80° from a mixture of Rn with a large excess of another gas the adsorption coeff. of the Rn is independent of the pressure of the second gas but falls approx. linearly with rise in its b.p. Measurements of the adsorption of Rn on technical org. pigments have shown that in general the adsorption increases with decreasing covering power. SiO_2 gel catalyses the decomp. of C_2H_4 . R. C.

Sorption of chlorine by silica gel. L. H. REYERSON and A. W. WISHART (J. Physical Chem., 1937, 41, 943—953; cf. A., 1935, 696).—Four isotherms are given for the range 35.9—81.5°. Equilibrium is attained rapidly (15 min.) and no hysteresis occurs. F. L. U.

Kinetics of sorption. II. Sorption of carbon monoxide on alumina. N. M. MOROZOV (J. Phys. Chem. Russ., 1937, 9, 641—658).—The velocity of sorption between -50° and 450° has been measured. Two types have been observed, one below 250—300°, and the other above 200°. The first is a rapid process (activation energy of desorption 9.9 kg.-cal. per mol.), the second a slower one (activation energy 19.1 kg.-cal. for sorption, 27.4 kg.-cal. for desorption). Sorption isothermals have been determined at -15° to 40° ; calc. heat vals. are 1.1 to 0.7 kg.-cal. for the high-temp. sorption and 1.6 to 1.0 kg.-cal. for the low-temp. sorption.

E. R.
Heat of interaction of cellulose nitrate with solvents. II. S. P. PAPKOV and V. A. KARGIN (J. Phys. Chem. Russ., 1937, 9, 631—643; cf. A., 1936, 1056).—Heats of sorption of EtOH and Et_2O by cellulose nitrate (I) have been determined. The isothermals for the sorption from solutions in light petroleum are recorded. 1 mol. of $\cdot\text{O}\cdot\text{NO}_2$ absorbs 0.35 mol. of EtOH and 0.1 mol. of Et_2O ; 1 mol. of OH absorbs 0.95 mol. of EtOH and 0.31 mol. of Et_2O . Heats of dissolution of (I) in EtOH- Et_2O mixtures are measured. The competition of EtOH and Et_2O in the solvation of (I) is discussed. E. R.

Adsorption of electrolytes on crystalline surfaces. VII. (MLLE.) L. DE BROUCKERE (Bull. Soc. chim. Belg., 1937, 46, 301—316; cf. A., 1936, 1195).—The $\log x - \log C$ curves (x —electrolyte adsorbed, C —concn. of solution) for the adsorption of MgCl_2 , CuCl_2 , and LaCl_3 at 25° on charged BaSO_4 (A., 1934, 359) are similar to those for alkali chlorides. At low concn. the adsorption on negatively charged BaSO_4 increases with the cationic charge of the electrolyte, but is const. on positively charged BaSO_4 . The saturation vals. for x , $(x_+)_+$, $(x_-)_-$, increase in the

order $\text{LaCl}_3 < \text{CuCl}_2 < \text{MgCl}_2 < \text{KCl} < \text{LiCl}$. $(x_2)_+ / (x_2)_-$ is lower for LaCl_3 than for alkali chlorides.

I. MOA.

Adsorption of organic substances on the surface of crystals and the influence of electrolytes on the extent of adsorption. N. A. HELD (Inst. Mech. Obr. Polz. Isk., 1935, 1, 136—161; cf. A., 1935, 1069).—Flotation experiments with various powdered minerals and org. collectors are described. The attractive forces operative in flotation are discussed.

CH. ABS. (e)

Adsorption of potential-determining ions. A. KELLERMANN and E. LANGE (Kolloid-Z., 1937, 81, 88—104).—A survey of theoretical and experimental work on ion adsorption in electrochemical two-phase systems.

F. L. U.

Capillary condensation in an artificial capillary space, and determination of the thickness of the water film adsorbed on glass. K. V. TSCHEMUTOV (J. Phys. Chem. Russ., 1937, 9, 345—349).—The condensation of H_2O vapour in the space between a plane and a convex glass surface has been measured and the radius r of the meniscus calc. according to W. Thomson's equation. The difference between the width of the capillary space and $2r$ represents the double thickness of the adsorbed H_2O film. The thickness increases from 4×10^{-6} to 39×10^{-6} cm. when the v.p. rises from 6 to 32 mm. Hg.

J. J. B.

Capillary systems. XIX. (2) Calculation and experimental determination of free space in compact or coherent material. E. MANEGOLD. (3) Effective free space in branched canal systems. E. MANEGOLD and K. SOLF (Kolloid-Z., 1937, 81, 19—35, 36—40; cf. A., 1937, I, 180).—(2) A comprehensive review is given of methods available for calculating or measuring the free space in compact material (e.g., atoms, ions, liquids, crystals) and in capillary systems such as wood, leather, charcoal, wool, powder, etc.

(3) The free space in porous solids which is "effective" with respect to the penetration or transmission of a fluid is calc. for simple cases in which the intercommunicating pores are of circular, square, and rectangular (slit-like) section.

F. L. U.

Drop formation as revealed by the high-speed motion camera. H. E. EDGERTON, E. A. HAUSER, and W. B. TUCKER (J. Physical Chem., 1937, 41, 1017—1028; cf. A., 1937, I, 99).—The apparatus previously described has been used to study the formation of drops of H_2O , PhNO_2 , $\text{EtOH-H}_2\text{O}$, glycerol- H_2O , glycerol-EtOH, and Na oleate- H_2O , from tips of different size. Primary drops from large tips are smaller, whilst those from small tips may be larger, than the tips. The no. of secondary drops formed by segmentation of the stem varies both with tip size and nature of the liquid, and in the experiments described varied between 0 and 15. A min. γ was observed in the freshly formed surfaces of aq. Na oleate solutions. It is found that the use of large tips for measuring γ is inadvisable and that the drop-wt. and drop-no. methods applied to mixtures or solutions are untrustworthy.

F. L. U.

Interfacial tension between a solution of palmitic acid in benzene and an aqueous solution of mono-, di-, or tri-ethanolamine. L. GAY and L. RAYMOND (J. Chim. phys., 1937, 34, 517—528).—The lowering of interfacial tension by amines at low concns. is $>$ that produced by NaOH or KOH. At higher amine concns. this order is reversed. Differences in the interfacial tension-concn. curves for the three amines are discussed.

D. F. R.

Wetting characteristics of a surface. A. VOET and J. F. VAN ELTEREN (Rec. trav. chim., 1937, 56, 923—926).—Drops of H_2O show a const. contact angle of 35° against a glass surface covered with an adsorbed layer of night-blue so long as the density of occupation of the surface (d) is $< 36\%$ of a unimol. layer. The contact angle decreases sharply as d falls below 36% and becomes 0° when $d = 32\%$.

J. W. S.

Wetting phenomena. H. LIMBURG (Chem. Weekblad, 1937, 34, 716—719).—Variations with time of the angle made by a drop of a 0.1% solution of a series of wetting agents on a carnauba wax surface have been studied. The rates of change are different for "advancing" and "receding" drops. The results are compared with those of wetting and penetration tests on a similar surface and with measurements of γ against liquid paraffin. Each method ranges the various wetting agents in a different order. The wetting power of a particular substance depends entirely on the method of assessment. In practically all methods at present used the surface does not reach equilibrium.

S. C.

Spreading and the electric potential at surfaces. J. DE HAAS (Chem. Weekblad, 1937, 34, 719—722).—Measurements are recorded of the electric potential at H_2O -air surfaces on which various substances have been spread. It is suggested that the observed variations are due to alterations in p_{H} and of H_2O or O content of the reaction layer, in which a normal oxidation-reduction reaction occurs.

S. C.

Electron rays and the structure of unimolecular films. J. DE WAELE (Chem. Weekblad, 1937, 34, 698—701).—The application of electron rays in the study of unimol. films of the Ba salts of the higher fatty acids is discussed.

S. C.

Built-up films of barium stearate. K. B. BLODGETT (J. Physical Chem., 1937, 41, 975—984; cf. A., 1935, 931).—Films of Ba stearate on a Cr plate corresponding with steps of two unimol. layers form an accurate colour gauge with which the thickness of monolayers of other substances can be measured. A method is described whereby monolayers < 5 Å. thick can be measured with a probable error of 2.5 Å. without the use of optical apparatus. Properties of Ba stearate films containing Cu and of skeleton films (A., 1937, I, 458) are discussed.

F. L. U.

Unimolecular films of α -aminostearic acid, stearic acid, and heptadecylamine. E. F. PORTER (J. Amer. Chem. Soc., 1937, 59, 1883—1888).—The mechanical and electrical properties of unimol. films of α -aminostearic acid (I), stearic acid (II), and heptadecylamine (III) have been measured on aq.

substrates of p_H 3—11. The area, extrapolated to zero compression, occupied by mols. of (I) in the iso-electric range is 30.3 sq. A., 50% > for non-ionised mols. of (II) or (III). Outside this range films of (I) are more expanded. The surface potential (V) of (I) resembles that of (II) on alkaline solutions and that of (III) on acid solutions. The fact that V for (I) is never for (II) or (III) leads to the conclusion that V cannot reflect exactly the magnitude of the electric moments of the mols. J. W. S.

Monolayers and multilayers of chlorophyll. I. LANGMUIR and V. J. SCHAEFER (J. Amer. Chem. Soc., 1937, 59, 2075—2076).—Monolayers of chlorophyll (I) on H_2O behave as two-dimensional liquids until submitted to pressures >20 dynes per cm., when they become viscous. Multilayers up to 600 layers thick can be built as Y layers (cf. A., 1937, I, 458) on glass or Cr, using a piston oil of tritoyl phosphate ($F = 9$ dynes per cm.) on H_2O . Assuming $n_D - 1.64$, the thickness of these films is 14.2 Å. With a piston oil pressure of 16 dynes per cm. hydrous films are formed with H_2O separating the A and B monolayers, which have total thickness 35 Å. Dehydrous multilayers have also been produced. A Y multilayer is not wetted by H_2O but is sol. in hydrocarbons, which are rendered fluorescent. (I) monolayers can be produced on Ba stearate multilayers. The fluorescence of (I) in C_6H_6 disappears when it spreads as a monolayer, indicating that the fluorescence is not due to dispersion alone.

J. W. S.

Built-up films of protein and of sterol. H. B. BULL (J. Physical Chem., 1937, 41, 985—986).—Films containing 100 unimol. layers of zein have been built up on highly polished Cr slides. The films are strongly hydrophilic. The thickness is 14 Å. per unimol. layer. Attempts to deposit similar films of egg-albumin were unsuccessful. Films of cholesterol, deposited from light petroleum, are strongly hydrophobic. F. L. U.

Relation between molecular stability and p_H . F. VLÈS (Bull. Assoc. Amicale Ing. Chim. Inst. Chim. Strasbourg, June, 1937, 97—113).—The influence of p_H on the constitution of dissolved mols., particularly as indicated by its effect on rotatory power and ultra-violet absorption, is discussed on the bases of experiments carried out during the past 12 years.

F. L. U.

Influence of electrolyte on non-aqueous cellulose nitrate solutions. II. Influence of heavy-metal salts and amines. N. V. MICHAÏLOV and V. A. KARGIN (J. Phys. Chem. Russ., 1937, 9, 805—814).—Small quantities of heavy-metal salts decrease the viscosity of $COMe_2$ solutions (e.g., by 30%). NH_3MeI decreases the viscosity, but NMe_4I increases it. The ζ -potential remains small (0.01 mv.) in presence of heavy-metal salts ($AgClO_4$, $HgCl_2$) but NMe_4I and NH_3EtCl increase sharply the negative ζ -potential (up to 0.3 mv.). $AgClO_4$ is strongly adsorbed by cellulose nitrate particles. E. R.

Influence of electrolytes on non-aqueous cellulose nitrate solutions. I. Actions of nitric acid and NH_3 . V. A. KARGIN and N. V. MICHAÏLOV (J. Phys. Chem. Russ., 1937, 9, 793—804).—The

electric conductivity of cellulose nitrate (I) in $COMe_2$ is due to the presence of HNO_3 and other electrolytes and not to dissociation of (I) itself. η of (I) attains a max. on addition of a quantity of NH_3 which corresponds with the neutralisation of the (I) acids. Measurements of ζ -potentials show that purified (I) carries no electric charges. Considerable amounts of electrolytes are adsorbed by (I) particles in $COMe_2$; comparison with the ζ -potential points to the mol. nature of the adsorption. Changes in viscosity produced by addition of HNO_3 and NH_3 are not due to electric charges on the particles, but to the entry of electrolyte molecules into the solvate layers.

E. R.

Apparent molar volume of inorganic salts in methyl alcohol solution. J. B. STARK and E. C. GILBERT (J. Amer. Chem. Soc., 1937, 59, 1818—1820).— d^{25} has been measured for solutions of $KCNS$, NH_4NO_3 , $Ca(NO_3)_2$, and $HgCl_2$ in $MeOH$. The apparent molar vols. are calc. and compared with data for aq. solutions. The differences can be explained in terms of the properties of the solvents. J. W. S.

Viscosity and fluidity of aqueous potassium ferrocyanide solutions. G. R. HOOD and J. C. WILLIAMS (Ohio J. Sci., 1935, 35, 415—420).—The η has been measured at 18° and 25° for 0.003—0.223 molar solutions. The data agree with $\phi = 1 - 0.0245\sqrt{c} - 0.3185c$ at 18°, and with $\phi = 1 - 0.0245\sqrt{c} - 0.3720c$ at 25°. The Falkenhagen const. $A = 0.0245$ accords with the expected val.

CH. ABS. (e)

Absorbing and reflecting powers of electrolytes in the far infra-red. C. H. CARTWRIGHT (J. Chem. Physics, 1937, 5, 776—786).—The absorbing and reflecting powers and the dispersion of solutions of HCl , $LiCl$, $NaCl$, KCl , KBr , LiI , KI , ZnI_2 , $MgSO_4$, KOH , and H_2SO_4 in the region 50—150 μ . have been measured by an apparatus which is described. The results are discussed in terms of Maxwell's equations in which the inertia of the ions is included, the influence of ions on the absorbing power of H_2O mols., the electrical conductivity for high-frequency electromagnetic fields, the radius and hydration of ions, and the validity of Stokes' law for the microscopic process involved.

W. R. A.

Optical absorption of cobalt chloride solutions. A. VON KISS and M. GERENDAS (Z. physikal. Chem., 1937, 180, 117—130).—The absorption curves in aq. solution and in presence of various salts have been measured between 200 and 730 $m\mu$. In conc. HCl there is a spectrum consisting of six band triplets, which appears to be the electron-vibration spectrum of the relatively stable complex $CoCl_4''$. Pure conc. aq. $CoCl_2$ has a quite different spectrum, and the solution probably contains, not $CoCl_4''$, but a mixture of complexes of different compositions, some of which unite to form polynuclear complexes. $CoCl_2$ solutions containing $LiCl$, $NaCl$, $MgCl$, and $CaCl_2$ have spectra similar to that in conc. HCl ; in the latter complex formation and dehydration occur at the same time. In conc. $ZnCl_2$ solution, however, the spectrum is structureless and similar to that of pure conc. aq. $CoCl_2$. There seems to be no simple relation between the dehydrating and the complex-forming

action of neutral salts. The reddish-violet colour of CoSO_4 in conc. H_2SO_4 and the blue colour of CoCl_2 in conc. aq. $\text{Na}_2\text{S}_2\text{O}_3$ are ascribed to sulphato- and thiosulphato-complexes, respectively. R. C.

Determination of the density of aerodispersoid particles (aerosuspensions of ammonium chloride, mercuric iodide, and magnesium oxide). K. N. SAMOCHVALOV (J. Phys. Chem. Russ., 1937, 9, 611—617).—Rate of sedimentation is measured by counting particles on the bottom at definite intervals and determining the average size of the settled particles. Stokes and Cunningham's law then gives the d . This is small even in fresh smokes and in the course of a single experiment it decreases in NH_4Cl smokes, remains const. in stabilised NH_4Cl and non-stabilised HgI_2 smokes, and rises in stabilised HgI_2 smokes. J. J. B.

Sedimentation analysis with photo-electric cell. E. G. RICHARDSON (Kolloid-Z., 1937, 81, 87—88).—Comments on a paper by Hoffmann (A., 1937, I, 374). The method described therein was published by the author in 1934 (B., 1934, 806).

Dependence of the absorption of sound in aerosols on frequency. O. BRANDT (Kolloid-Z., 1937, 81, 2—6).—See A., 1937, I, 230. F. L. U.

Experimental investigation of the light scattering by organosols of metals in media of varying refractivity. J. I. VEIZER (J. Phys. Chem. Russ., 1937, 9, 486—492).—Experiments have been made with Svedberg's Al sol in MeOH diluted with Bu^nOH , CHCl_3 , and $\text{CHCl}_3 + \text{CS}_2$; with Svedberg's Fe sol in MeOH diluted with CHCl_3 and C_6H_6 ; with Svedberg's Mg sol in MeOH diluted with CHCl_3 ; and with hydrosol of Au diluted with COMe_2 and quinoline. In agreement with Mie's theory the intensity of the Tyndall beam increases with increasing refractivity of the medium for Au sol. The relation is inverted for the other sols, which are coarser; this agrees with the theory of ordinary reflexion. J. J. B.

Reciprocity theorem in colloid optics. R. S. KRISHNAN (Current Sci., 1937, 6, 90—91).—A preliminary account is given of the relative intensities of the light from beams characterised by vertical and horizontal vibrations, respectively, when the light is scattered transversely by colloids. The results agree with the author's theory (A., 1935, 1075) but disprove that of Gans (A., 1937, I, 496) in which no account is taken of the magnetic and higher electrical partial waves. F. R. G.

Viscosity of suspensions and solutions. VIII. Inertia effects of suspended spheres. F. ERICH and O. GOLDSCHMID (Kolloid-Z., 1937, 81, 7—18; cf. A., 1936, 1066).—The η of suspensions of glass spheres with radii 0.016—0.0075 cm. is in substantial agreement with the modified Einstein formula $+2.5c + 14.1c^2$ when determined in the Couette apparatus. Lower vals. are obtained with the capillary viscosimeter. The observed differences, which are attributed to different modes of flow, support the view that the effect is due to inertia forces. A theoretical discussion is given. F. L. U.

Applications of ultrasonics in colloid investigation. H. A. WANNOW (Kolloid-Z., 1937, 81, 105—113).—Recent work is reviewed, with special reference to the production of ultrasonic waves, their dispersing and coagulatory effects, and their influence on the orientation of anisodimensional particles.

F. L. U.

Effect of X-radiation on colloidal carbon. J. A. CROWTHER, H. LIEBMANN, and T. B. LANE (Phil. Mag., 1937, [vii], 24, 654—664).—Exposure to X-rays produces changes in the potential of the colloid particle, the potential showing alternate max. and min. with increasing exposure. K. S.

Increase of negative photophoresis by a high-frequency electric field. G. GROETZINGER (Physikal. Z., 1937, 38, 766—767).—The behaviour of sub-microscopic particles exposed to light in a high-frequency electric field (8×10^7 Hertz) has been investigated. In the case of Se and Te a few particles move rapidly in a direction opposite to that of the light when the field is applied, but the remainder fall at the normal rate. The particles affected show negative photophoresis which is increased by the field. Particles showing positive photophoresis are not affected. A. J. M.

Colloidal properties of clays as related to their crystal structure. C. E. MARSHALL (J. Physical Chem., 1937, 41, 935—942).—The cryst. structure of halloysite, kaolinite, pyrophyllite, talc, beidellite, and montmorillonite is discussed in relation to base exchange capacity and electrical properties.

F. L. U.

Coagulation coefficient of ammonium chloride smokes. L. V. RADUSCHKEVITSCH (J. Phys. Chem. Russ., 1937, 9, 883—888).—Coagulation coeffs. ranging from 2.6×10^{-8} to 5.4×10^{-8} (c.c./min.) have been found for NH_4Cl smokes, with a density about 19.2 mg. per cu. m. The vals. are const. for a given smoke, but change occurs as a result of condensation and re-sublimation. It is probably due to circumstances which affect the shape of the particles and the amounts of NH_3 , HCl , and H_2O which are sorbed. E. R.

Electrolyte coagulation of weakly solvated sols and electrolyte activity. X. Influence of non-electrolytes. W. OSTWALD, H. KOKKOROS, and K. HOFFMANN (Kolloid-Z., 1937, 81, 48—61; cf. A., 1937, I, 410).—The coagulation consns. of NaCl , MgCl_2 , and LaCl_3 for sols of As_2S_3 in H_2O — EtOH mixtures are < those for the pure hydrosols. The observed effects are in quant. agreement with the author's theory when account is taken of the change in the activity coeff. of the electrolyte resulting from decrease of the dielectric const. of the dispersion medium. F. L. U.

Ageing of precipitates. XV. Mechanism of the interaction between dissolved bromide and solid silver chloride. I. M. KOLTHOFF and H. C. YUTZY (J. Amer. Chem. Soc., 1937, 59, 2029—2032; cf. A., 1937, I, 564).—The rate of distribution (v) of Br' between a solution containing Cl' and Br' and a well-aged AgCl ppt. increases with increasing ratio (r) of Br' in solution to Ag in the ppt. When r

is small, v is determined by the velocity of recrystallisation of the AgCl. The greater val. of v when r is large is attributed to direct attack of Br' on solid AgCl. The Br' taken up in the surface by exchange is assumed to cause disruption of the AgCl lattice, exposing fresh surfaces to attack. J. W. S.

Reversal of charge of the disperse phase of organic and inorganic dispersoids by radon. E. EPSTEIN (Kolloid-Z., 1937, 81, 80—87).—Rn dissolved in a phosphatide sol causes flocculation which is complete in 24 hr. Under similar treatment a red Au sol becomes blue. F. L. U.

Chemical reactions between colloids of the same sign. I—III. R. TSCHERNITZKAJA and V. KARGIN (J. Phys. Chem. Russ., 1937, 9, 461—470, 471—480, 481—485).—I. According to spectroscopic observations the rate of reaction between colloidal V_2O_5 and As_2S_3 is almost independent of the dilution of the $As_2S_3 + 3V_2O_5$ mixture. For such a mixture the rate $\propto [H^+]$ and the calc. surface of the particles. The explanation advanced is that As_2S_3 particles react with the molecularly dissolved V_2O_5 the concn. of which is independent of dilution, being that of saturated V_2O_5 . Formation of V_2O_4 during an experiment causes a decrease of $[H^+]$ and $[VO_3^-]$. That the reaction does not occur between colloid particles is also indicated by the fact that gelatin is unable to retard it.

II. The light absorption, $[Ag^+]$, and electrical conductance of reacting $AgBr + As_2S_3$ and $AgI + As_2S_3$ mixtures, and the electrical conductance and $[Ag^+]$ of $AgBr + Sb_2S_3$ and $AgI + Sb_2S_3$, have been measured. The relationship between the reaction rate and dilution is irregular. Coagulation interferes with the reaction. The total change is more rapid in systems containing $AgBr$ than in those containing AgI .

III. When vapours of H_2O , Hg , and S are frozen out on a cooled glass surface (cf. Rabinovitch *et al.*, A., 1931, 560) and then thawed, the mixed sol obtained is very unstable but no formation of HgS takes place in the absence of air. Colloid particles do not affect one another but react with the intermicellar liquid only. J. J. B.

Properties of the saponin sol. R. RUYSSSEN and E. O. K. VERSTRAETE (Natuurwetensch. Tijds., 1937, 19, 169—183).—Electrodialysed, ash-free saponin sols are pronouncedly acid in character (p_H 3.08 at 1%) and potentiometric titrations with NaOH show a sharp inflection at p_H 7.95 (acid equiv. 1712). The sols are discharged by multivalent ions (Th^{+++} , Al^{+++}) but are flocculated only by Hexol nitrate. The reciprocal Th no. is rather $<$ the acid equiv. Flocculation occurs with $COMe_2$ but not with EtOH. The η and the Gortner effect show that the hydration of the sol is extremely small. The electro-viscous effect is also discussed. Saponins can be purified conveniently by pptn. of the EtOH extract with $COMe_2$ and Et_2O followed by dissolution in H_2O and pptn. with $COMe_2$ after dialysis. S. C.

Thixotropy. II. Thixotropic behaviour and structure of bentonite. E. A. HAUSER and C. E. REED (J. Physical Chem., 1937, 41, 911—934; cf.

A., 1937, I, 181).—Base exchange capacities and concn. relations of five fractions of H bentonite having mean particle radii (r) 7—43 $m\mu$. are identical. Sp. conductivity increases with decrease in r , and is that calc. from the H^+ activity. Comparing suspensions of the same wt. concn. but different r , the time required for gelation in presence of KOH decreases with fall in r . With the finest particles there is evidence of gel structure for a concn. $<0.05\%$. In the ultramicroscope gelating suspensions show the formation of primary aggregates which then form a network. F. L. U.

Diffusion constants of the amino-acids. A. POLSON (Biochem. J., 1937, 31, 1903—1912).—The diffusion consts. (D) of some H_2O -sol. NH_2 -acids have been determined at several concns. and found to depend on mol. size and shape. Arginine, which is a stretched mol. of M 174, has D 57.6×10^{-7} sq. cm. per sec., whilst tryptophan, which is a more spherical mol. of M 204, has D 61.4×10^{-7} sq. cm. per sec. Results with proline show that it exists in the same condition in 71.5% EtOH as in H_2O , but that in abs. EtOH it forms an association product with M 3 or 4 times that of proline. Comparative results obtained by Mehls' porous disc method give a roughly const. ratio of 0.8825 : 1. P. G. M.

Gels. H. FREUNDLICH (J. Physical Chem., 1937, 41, 901—910).—A review of recent work on hydration, thixotropy, rheopexy, and swelling. F. L. U.

Electrolytic properties of proteins and their structure. G. ETTISCH (J. Chim. phys., 1937, 34, 473—506).—The reaction of proteins with acids and with bases occurs in two stages. The primary (instantaneous) reaction can be successfully explained by Bjerrum's theory of ampholytes, treating the protein as an "ampholyte of higher order." The secondary (slow) reaction, studied by reference to viscosity, depolarisation, and diffusion data, involves an initial expansion of the protein mol., followed, on increasing the p_H , by a reversible splitting-up of the mol.; above p_H 11, and for low p_H at elevated temp., this latter stage is irreversible. The effect of neutral salts is discussed. Previous measurements of the affinity of protein for Cu (A., 1931, 503) are in accordance with this theory. D. F. R.

Electrokinetic aspects of surface chemistry. II. Electrokinetic theory in the calculation of the charge of proteins. L. S. MOYER and J. C. ABELS (J. Biol. Chem., 1937, 121, 331—344).—Calculation of the charge on the egg-albumin "mol." from titration curves of solutions at const. ionic strength (0.02) yields results which are in fair agreement with those derived from electric mobility measurements. The data are discussed and an expression is derived by which electric mobilities of proteins may be calc. from titration curves. C. R. H.

Dielectric measurements with hydrophilic colloids. I. Measurements with agar and gelatin at 261 m. P. J. DENEKAMP and H. R. KRUYT (Kolloid-Z., 1937, 81, 62—80).—The ϵ of 0.5% agar sol is about 4% $>$ that of H_2O , and the same increase is observed when the agar is in the form of gel. Addition of tannic acid, EtOH, or $COMe_2$ causes a

reduction of ϵ , whence it is inferred that the increase in the case of the sol or gel is due to hydration. Addition of a quadrivalent cation, which markedly lowers η , is without influence on ϵ . Gelatin sols exhibit a similar increase of ϵ , but the val. is diminished on gelatinisation, owing to the micelle possessing a permanent electric moment. F. L. U.

Electrometric determination of the p_H of gelatin gels with the quinhydrone electrode. J. SWYNGEDAUF (Compt. rend. Soc. Biol., 1937, 126, 42—43).—Between p_H 1.5 and 9.5 the vals. obtained with quinhydrone and H_2 electrodes agree within 0.04 p_H unit; the use of the quinhydrone electrode is more expeditious. H. G. R.

Quantitative study of electrofiltration of gelatin gels as a function of the p_H . J. SWYNGEDAUF (Compt. rend. Soc. Biol., 1937, 126, 39—41).—The rate of electrofiltration is a function of the p_H near the isoelectric point but reaches a const. val. below p_H 3.5 and above p_H 6.5; the lower p_H region is represented by a greater rate than the higher. H. G. R.

Electrochemical preparation of isoelectric gelatin. Deviations in the isoelectric point of commercial gelatin. J. SWYNGEDAUF (Compt. rend. Soc. Biol., 1937, 126, 35—37).—The method (cf. A., 1936, 1396) is superior to that of Loeb and gives a yield of 60—70%. Variations of p_H between 4.68 and 5.32 have been observed in the examination of various samples of gelatin. H. G. R.

Checking isoelectric state of gelatin gels by electrofiltration. J. SWYNGEDAUF (Compt. rend. Soc. Biol., 1937, 126, 33—35).—The precision of the method is comparable with that of the electrophoretic method. H. G. R.

Structure catalyst. R. E. LIESEGANG (Kolloid-Z., 1937, 81, 1—2).—When KCl diffuses into gelatin jelly containing $AgNO_3$, the resulting ppt. is uniformly distributed. If, however, a very small amount of Ag_2CrO_4 (or $K_2Cr_2O_7$) is added, the ppt. is banded. By using an old dried gelatin prep. with concentric rings of Ag_2CrO_4 , a diffusion of KCl from one side produced an interlacing pattern of rings, in which the Ag_2CrO_4 was partly changed to $AgCl$ *in situ*, whilst an independent ring system of $AgCl$ was simultaneously formed. F. L. U.

Vapour density of nitrogen tetroxide over carbon tetrachloride solutions by a colorimetric method. E. D. COON (J. Amer. Chem. Soc., 1937, 59, 1910—1912).—The concns. of NO_2 and N_2O_4 over solutions in CCl_4 have been determined by combination of colorimetric and v.p. data. The equilibrium consts. in this system have been calc. and show that the solutions are nearly ideal. J. W. S.

Dissociation constants of chlorophenol-blue and iodophenol-blue. F. W. PANEPINTO and M. KILPATRICK (J. Amer. Chem. Soc., 1937, 59, 1876—1878; cf. A., 1934, 1307).—From measurements in OBz' and OAc' buffer solutions it is found that the thermodynamic dissociation consts. of chlorophenol-blue and iodophenol-blue are 3.7×10^{-5} and 6.4×10^{-5} , respectively. J. W. S.

Ionisation constants of some secondary amines in methanol. C. L. MEHLTRETER (Iowa State Coll. J. Sci., 1936, 10, 87—89).—The order of polarity for the secondary amines is the same as that for the corresponding primary amines. The solvent and radical effects are const. for each series.

CH. ABS. (e)

Basic dissociation constant of α -picoline. E. S. G. BARRON (J. Biol. Chem., 1937, 121, 313—314).—Data for titration with HCl using a glass electrode give a mean val. $K_b = 1.05 \times 10^{-8}$ at 25°. C. R. H.

Acidity in non-aqueous solution. M. KILPATRICK (Trans. Electrochem. Soc., 1937, 72, Preprint 27, 411—420).—The construction of a general acidity scale applicable to any solvent is discussed. F. L. U.

Chemical hydration numbers. J. KIELLAND (J. Chem. Educ., 1937, 14, 412—413).—The nos. calc. by Ulich (A., 1930, 1251) for various ions have been revised and extended. Hydration nos. for 32 gases and org. compounds in H_2O have also been calc. by the entropy deficiency method. The hydration of these non-electrolytes is as great as that of the low-valent ions. The higher aliphatic alcohols have nos. corresponding with the most highly hydrated univalent ions. For aliphatic compounds the hydration nos. are approx. additive, and the following preliminary vals. are assigned: $\cdot OH$, 2; $\cdot NH_2$, 2; $\cdot CO$, 1; $\cdot Cl$, 1; $\cdot Me$, 1; $\cdot CH_3$, 1; and $\cdot CH$, 1. L. S. T.

One-third basic aluminium acetate solution. III. Further properties of the solution. C. ROHMANN and W. MIRUS (Arch. Pharm., 1937, 275, 541—552; cf. A., 1937, I, 184).—Vals. of Λ at 16° and 25°, f.p. depression, dialysis const., and γ support the view that this solution contains a polymerised univalent ion. The degree of polymerisation in 0.2N solution is approx. 2 and in 1.0N solution approx. 2.8. The dimeride is associated with 18 and the trimeride with about 12 H_2O . R. S. C.

Variation of the activity coefficient of hydrochloric acid in hydrochloric acid-sodium chloride solutions of constant total ionic strength from 0° to 50° and the solubility of sodium chloride in hydrochloric acid solutions at 25° with methyl alcohol-water mixtures as solvent. G. ÅKERLOF, J. W. TEARE, and H. TUROK (J. Amer. Chem. Soc., 1937, 59, 1916—1920; cf. A., 1930, 996).—E.m.f. data have been obtained for cells $Pt, H_2[HCl(m), NaCl(1-m), \text{in aq. MeOH}(x \text{ wt. } \%)][AgCl]Ag$ at 0—50° with $x = 0-60$, and $m = 0.1-1.0$. It is deduced that in HCl-NaCl solutions of total ionic strength $= 1 \log f$ (f = activity coeff. of HCl) varies linearly with m , and $d \log f / dm$ is independent of $[MeOH]$. The solubility of NaCl in HCl- H_2O -MeOH mixtures at 25° is such that the activity coeff. varies with $[MeOH]$ independently of the $[HCl]$. J. W. S.

Thermodynamics of concentrated aqueous solutions of hydrochloric acid. G. ÅKERLOF and J. W. TEARE (J. Amer. Chem. Soc., 1937, 59, 1855—1868).—The e.m.f. of the cell $H_2[HCl(m), AgCl]Ag$ has been studied for m (mols. HCl per 1000 g. H_2O) — 3—16 at 0—50°. The activity coeff. (f) of HCl is

given by $\log f = -u\sqrt{m}/(1 + 2\sqrt{m}) + Bm + Cm^2 + Dm^3 + Em^4$, where u is the universal const. of the Debye-Hückel limiting law and B , C , D , and E are consts. varying linearly with temp. Equations are derived for the activity of the solvent, and the relative partial molar heat content, heat capacity, free energy, and entropy of both solute and solvent. J. W. S.

Activity and osmotic coefficients of some hydroxide-chloride mixtures in aqueous solution. H. S. HARNED and M. A. COOK (J. Amer. Chem. Soc., 1937, 59, 1890—1893).—From e.m.f. measurements on the cells $H_2|MOH(m_1), MCl(m_2)|M_xHg|MOH(m_0)|H_2$ and $Ag|AgCl, MOH(m_1), MCl(m_2)|M_xHg|MCl(m_0')|Ag$ ($M = Na$ or K) the activity coeff. (f) of the hydroxide and chloride in solutions of total concn. 0.5 and 1.0M have been determined. Contrary to observations on other uni-univalent electrolyte mixtures f can be expressed by $-\log f = -\log f_0 + \alpha m + \beta m^2$, where m is the partial molar concn. of the hydroxide or chloride and f_0 the activity coeff. in the pure aq. solution at the const. total molarity under consideration. J. W. S.

Thermodynamics of aqueous sodium bromide solutions from electromotive force measurements. H. S. HARNED and C. C. CRAWFORD (J. Amer. Chem. Soc., 1937, 59, 1903—1905; cf. A., 1929, 513).—The e.m.f. of the cells $Ag|AgBr, NaBr(c)|Na_xHg|NaBr(0.1M), AgBr|Ag$ has been determined at 0—40° for $c = 0.1$ —4M. The activity coeff., relative partial molar heat content, and heat capacity of NaBr in the solutions are calc., fairly good agreement being obtained with calorimetric vals. J. W. S.

Ionic activity coefficient product and ionisation of water in barium chloride solutions from 0° to 50°. H. S. HARNED and C. G. GEARY (J. Amer. Chem. Soc., 1937, 59, 2032—2035).—The e.m.f. of the cells $H_2|Ba(OH)_2(0.005M), BaCl_2(m)|AgCl|Ag$ and $H_2|HCl(0.01M), BaCl_2(m)|AgCl|Ag$ has been measured at 0—50°. From the results the standard potential of the Ag - $AgCl$ electrode, ionisation const. of H_2O , activity coeff. and relative partial molar heat content of HCl in $BaOH$ solutions, the ionic activity coeff. product, ionisation, and heat of ionisation of H_2O in these solutions are calc. for this temp. range. J. W. S.

Dissociation pressures of potassium deuteroxide and potassium hydride. (Miss) E. F. SOLLERS and J. L. CRENSHAW (J. Amer. Chem. Soc., 1937, 59, 2015—2022).—The dissociation pressures (p) of KH and KD have been measured at 270—360°, the results for KH being in accord with those of Keyes (A., 1912, ii, 627). p for KD is approx. double that for KH at the same temp. The calc. heats of formation of KH and KD are 14,150 and 14,450 g.-cal. per mol., respectively. A possible method of separating H_2 and D_2 by passing the gases over an excess of K is suggested. J. W. S.

Freezing points of the system *p*-dioxan-*tert*-butyl alcohol. F. H. GETMAN (Rec. trav. chim., 1937, 56, 927—930).—A eutectic is formed at -9.15°. The anomalous variation of the mol. wt. of Bu^tOH as calc. from f.-p. depressions in dioxan cannot be attributed to mixed crystal formation. J. W. S.

Systems of carbamide with nitrobenzene, *m*-dinitrobenzene, and 1:3:5-trinitrobenzene. D. A. VAN DORP, J. LIMBURG, and P. C. NOBEL (Rec. trav. chim., 1937, 56, 983—984).—The characteristic points in the m.p. diagrams of the three systems are tabulated. The solubility of $CO(NH_2)_2$ in $PhNO_2$ or C_6H_6 at low temp. is so small that the f.-p. depression cannot be detected on a Beckman thermometer.

J. W. S.

Ternary system methyl alcohol, toluene, and water. L. S. MASON and E. R. WASHBURN (J. Amer. Chem. Soc., 1937, 59, 2076—2077).—The solubility of H_2O in $MeOH$ - $PhMe$ mixtures has been determined at 25° and n_D measured for the equilibrium solutions. The distribution ratio of $MeOH$ between $PhMe$ and H_2O is 0.01 at low concn. but increases with increasing $[MeOH]$, probably owing, in part, to the increased miscibility of H_2O and $PhMe$ in presence of $MeOH$. J. W. S.

Solubility relations in the system lead acetate-sodium acetate-acetic acid at 30°. E. GRISWOLD and F. V. OLSON (J. Amer. Chem. Soc., 1937, 59, 1894—1895).—The solubilities (s) of $Pb(OAc)_2$ and $NaOAc$ in $AcOH$ at 30° are 19.72 and 7.70 mol.-%, respectively, the solid phases being $Pb(OAc)_2 \cdot 0.5AcOH$ and $NaOAc \cdot 2AcOH$, respectively. No other solid phase has been obtained. s for each acetate increases with increasing concn. of the other salt. The solution in equilibrium with both salts contains approx. 24.5 mol.-% of $Pb(OAc)_2$ and 14.0 mol.-% of $NaOAc$. J. W. S.

25° solubility isotherm of the system K_2O - P_2O_5 - H_2O . L. G. BERG (Kali, 1937, No. 1, 28—36).—Slowness of crystallisation and the formation of metastable phases introduce difficulties in the determination of the isotherm. The existence of a section characterised by anhyd. K_3PO_4 as the solid phase (D'Ans *et al.*, A., 1910, ii, 1050; 1914, ii, 848) is not confirmed. Mono-, di-, and tri-substituted K phosphates can be crystallised satisfactorily. K_3PO_4 crystallises as the tri- or hepta-hydrate. The octahydrate described by Janecke (A., 1927, 731) is not indicated but the existence of the double salt $KH_2PO_4 \cdot 2K_2HPO_4 \cdot H_2O$ is confirmed. D. G.

Crystallographic study of the solid phases in the system K_2O - P_2O_5 - H_2O . (1) $KH_2PO_4 \cdot H_3PO_4$, (2) $K_2HPO_4 \cdot 3H_2O$. G. B. BOKIJ and E. E. BUROVAJA (Kali, 1937, No. 2, 32—33).— $KH_2PO_4 \cdot H_3PO_4$ can be obtained in the form of well-defined crystals. Isothermal crystallisation at 20° gives symmetrical crystals, whilst those obtained on cooling from 60° to 20° consist of flat plates. $K_2HPO_4 \cdot 3H_2O$ forms elongated and lamellar crystals. Illustrations and measurements are given. D. G.

Solubility study of the system ammonia-phosphoric acid-water at 50°. B. A. MUROMTZEV (Kali, 1937, No. 1, 36—39).—The results obtained at 50° are compared with those of D'Ans and Schreiner (A., 1910, ii, 1050) at 25° and those of Janecke (A., 1927, 731) at 0°. Addition of H_3PO_4 has no effect on the solubility of $NH_4H_2PO_4$ whilst $(NH_4)_2HPO_4$ greatly increases it. The mono-ammonium salt section is distinctly curved, whereas the di-ammonium salt section is almost a straight line and the

(NH_4)₃PO₄·3H₂O section is much straighter than at lower temp. D. G.

Ice fields of the ternary systems potassium oxide-phosphoric anhydride-water, and ammonia-phosphoric anhydride-water. M. I. RAVITSCH and N. B. TROITZKAJA (Kalii, 1937, No. 3, 34—41).—The equilibrium relations are discussed with particular reference to the ice fields. D. G.

Solubility isotherms of di-substituted phosphates of potassium and ammonium at 0°. The system K_2HPO_4 —(NH_4)₂HPO₄—H₂O. S. I. SOKOLOV (Kalii, 1937, No. 2, 28—32).—The solubility curve consists of two sections corresponding with the separation of the solid phases (NH_4)₂HPO₄ and K_2HPO_4 ·6H₂O. Mixed crystals are not formed.

Quaternary system K_2O — NH_3 — P_2O_5 —H₂O. Solid solutions in the system KH_2PO_4 — $\text{NH}_4\text{H}_2\text{PO}_4$ —H₂O. N. S. DOMBROVSKAJA and A. J. ZVORIKIN (Kalii, 1937, No. 2, 24—28).—The 25° and 50° isotherms have been determined. The results of Askenasy and Nessler (A., 1930, 872) indicating the existence of a continuous series of solid solutions have been confirmed. D. G.

Equilibrium of the system TiO_2 — SO_3 —H₂O at 100°. I. Hydrolysis product of titanium sulphate solution. T. SAGAWA (Kinz.-no-Kenk., 1935, 12, 543—547).— TiO_2 containing 2—5% SO_3 and 3—5% H₂O is pptd. by the hydrolysis of $\text{Ti}(\text{HSO}_4)_4$ at 100°. The SO_3 and H₂O are believed to be adsorbed on the TiO_2 . Pptn. of TiO_2 ·H₂O occurs when solutions of much greater concn. are hydrolysed.

CH. ABS. (e)

Metastable hydrates of magnesium sulphate in the ternary system: magnesium chloride—magnesium sulphate—water. N. S. KURNAKOV and V. G. KUZNETZOV (Trans. VI Mendeleev Congr., 1935, 1932, 2, Part I, 619).—Data relating to the isothermal evaporation of solutions at 25° and 35° are recorded; solubilities and d vals. at 25° are also given.

CH. ABS. (e)

Nature and structure of the micro-disperse crystals in the system NH_4Cl — CoCl_2 —H₂O. N. S. KURNAKOV, N. P. LUSHNAJA, and V. G. KUZNETZOV (Bull. Acad. Sci. U.R.S.S., Sér. Chim., 1937, 577—606).—The solid phases in the system at —29.5° to 50° are $2\text{NH}_4\text{Cl} \cdot \text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ (I) and α - and β -crystals. The α -crystals are micro-disperse mixtures of (I) with solid solutions of (I) or of $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ (II) in NH_4Cl , whilst the β -crystals represent micro-disperse mixtures of a solid solution of (II) in (I) with (II). The lattice const. of NH_4Cl diminishes with increasing [CoCl_2] of the solid phase. R. T.

Anomalous solid solutions in the system NH_4Cl — MnCl_2 —H₂O. N. S. KURNAKOV and N. K. VOSKRESENSKAJA (Bull. Acad. Sci. U.R.S.S., Sér. Chim., 1937, 607—630).—Four types of solid phases are formed in the system at 25°: α - [<15.4 mol.-% $\text{MnCl}_2 \cdot 2\text{H}_2\text{O}$ (I)], consisting of micro-inclusions of a solid solution of NH_4Cl in $2\text{NH}_4\text{Cl} \cdot \text{MnCl}_2 \cdot 2\text{H}_2\text{O}$ (II) in a solid solution of (I) in NH_4Cl ; β - [16.9—33.3 mol.-% (I)], representing an inversion of the above system; β' - [33.3—34.3 mol.-% (I)], consisting of

(I) dispersed in (II); γ -crystals, consisting of NH_4Cl or (II) dispersed in $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$. Crystallographic and space lattice data are recorded for (II). R. T.

Equilibrium diagram of the ternary system CaO — TiO_2 — SiO_2 — CaO — SiO_2 — CaO — Al_2O_3 — 2SiO_2 . U. NISHIOKA (Kinz.-no-Kenk., 1935, 12, 449—458).—The diagram is of the simple eutectic type with a ternary eutectic point at 1240° (CaO — TiO_2 — SiO_2 , 25, CaO — SiO_2 37.5, CaO — Al_2O_3 — 2SiO_2 37.5 wt.-%).

CH. ABS. (e)

Solubility isotherm of the reciprocal system FeSO_4 — NaCl at 25°. L. BERG (Trans. VI Mendeleev Congr., 1935, 1932, 2, Pt. I, 619—620).—The system resembles the system MgSO_4 — NaCl . Fe astrakhanite resembles Mg astrakhanite in its optical properties and cryst. form, but is formed more readily. Pure $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ may be obtained by filtering, crystallising, and drying in an atm. of Et_2O vapour.

CH. ABS. (e)

Fugacity of gas mixtures. I. R. KRITSCHESKI (J. Phys. Chem. Russ., 1937, 9, 659—667).—Theoretical. E. R.

Free energies of formation of sodium carbonate and hydrogen carbonate. I. R. KRITSCHESKI and J. S. KASARNOVSKI (J. Phys. Chem. Russ., 1937, 9, 668—680).—The free energy of formation (ΔF) of Na_2CO_3 is calc. (a) from the sum of changes in F corresponding with eight partial reactions, and (b) from the third law of thermodynamics. The vals. obtained are $\Delta F_{298.1} = 249.8$ kg.-cal. (a) and 251.8 kg.-cal. (b). The corresponding vals. for NaHCO_3 are 203.2 and 204.3 kg.-cal. For the reaction $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_{2(\text{gas})}$, $\Delta F_{373.1} = 2.0$ kg.-cal. (calc.), compared with 2.5 kg.-cal. (exp.).

E. R.

Thermodynamics of lead iodide. (Miss) J. Y. CANN and (Miss) A. C. TAYLOR (J. Amer. Chem. Soc., 1937, 59, 1987—1989).—From e.m.f. measurements on the cell $\text{PbHg} \cdot \text{IPbI}_2(\text{s})$, $\text{PbI}_2(\text{sat.}) + m\text{KI}(\text{aq.})$, $\text{AgI}(\text{s})|\text{Ag}(\text{s})$ the vals. of ΔG , ΔH , and ΔS for the reaction $\text{Pb} + \text{I}_2 = \text{PbI}_2$ are —41,479, —42,259, and 1.11 g.-cal. per mol., respectively. J. W. S.

Energy hump in chemistry. II. W. D. BANCROFT and J. E. MAGOFFIN (J. Franklin Inst., 1937, 224, 475—499).—The theory of the energy hump (A., 1937, I, 567) is applied to the H_2 — 2H^+ reaction. There are two energy humps corresponding respectively with $2\text{H}^+ \rightarrow \text{H}_2$ (given by the cathodic over-voltage), and $\text{H}_2 \rightarrow 2\text{H}^+$. Platinised Pt removes both humps, and makes the H electrode reversible. The increasing effectiveness of H_2 for pptg. metals from solutions of their salts as pressure and temp. are increased is due to the decrease of the energy hump under these conditions. O_2 also has two energy humps corresponding with 0.3 v. in acid solution and 0.36 v. in alkaline solution. Catalyses of all types, including contact, solvent, H^+ , and H_2O vapour catalysis, can all be explained by the removal of the energy hump. A catalytic agent may initiate a reaction, and such catalysts may be said to act like a siphon, rather than like a lubricant. A. J. M.

Modern thermochemistry and its scientific and technical importance. W. A. ROTH (Chem.-Ztg., 1937, 61, 897—900).—A review.

Heat of formation and specific heat of silicon nitride. S. SATOH (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 906—914).—Ice calorimeter measurements for the temp. intervals 0—99.5°, 0—316.4°, and 0—585° indicate that the sp. heat (c) of Si_3N_4 is given by $c = 0.165 + 1.847 \times 10^{-4}\theta - 4.5 \times 10^{-8}\theta^2$ ($\theta = ^\circ\text{C}$). From these vals. and the dissociation pressure at high temp. the calc. heat of formation of Si_3N_4 is 163,000 g.-cal. per mol. J. W. S.

Equilibrium $\text{CMe}_3\text{I} \rightleftharpoons \text{CMe}_2\text{CH}_2 + \text{HI}$. J. L. JONES and R. A. OGG, jun. (J. Amer. Chem. Soc., 1937, **59**, 1943—1945).—The thermal decomp. of Bu^tI is heterogeneous. At 408—464° K. the heat of reaction is $-19,150 \pm 1000$ g.-cal. per mol. The calc. standard entropy of liquid Bu^tI is $S_{298} = 60.2 \pm 3.3$ entropy units in accord with theory, whilst the free energy of formation of the gas is 6260 g.-cal. per mol. J. W. S.

Differential dilution of sodium hydroxide solutions. F. L. E. SHIBATA and F. MURATA (J. Sci. Hiroshima Univ., 1937, **A**, 7, 335—340).—The e.m.f. of the reversible cell $\text{H}_2(\text{Pt})|\text{NaOH aq.}, \text{HgO}|\text{Hg}$ has been measured for solutions (0.5 molal to saturated) at 20° to 30°. ΔF and ΔH for the differential dilution of NaOH solution are calc. for all concns. The following consts. are obtained. Initial heat of dilution of NaOH solution, $\Delta H - \Delta H'$, -2626 g.-cal.; $\text{NaOH}, \text{H}_2\text{O} \rightarrow$ saturated solution, ΔH_{298} , 666 g.-cal.; $\text{Hg} + 0.5\text{O}_2 = \text{HgO}$, ΔF_{298} , $-13,850$ g.-cal., ΔH_{298} , $-21,625$ g.-cal., ΔS_{298} , -26.08 g.-cal. per degree O. D. S.

Isotope effects in heats of dissolution of 99 salts and of mercuric cyanide at 25°. E. LANGE and W. MARTIN (Z. physikal. Chem., 1937, **180**, 233—245; cf. A., 1936, 1340).—The differences in the first heats of dissolution in D_2O and H_2O at 25° have been determined and resolved into the contributions of the constituent ions. The heat of hydration of $\text{Hg}(\text{CN})_2$ has been calc. and the heat of dissolution and the isotope effect have each been resolved into a component due to van der Waals adhesion and one due to the heat of void formation. A similar resolution for alkali halides has shown that the heat of formation of voids accounts for a considerable part of the heat of ionic hydration. R. C.

Heats of combustion and formation of gaseous normal olefines. F. D. ROSSINI and J. W. KNOWLTON (J. Res. Nat. Bur. Stand., 1937, **19**, 339—345).—Existing data are discussed, and a list of "best" vals. for the heats of combustion of the gaseous hydrocarbons at 25°/1 atm. (H_2O liquid), and of heats of formation at 25° and at 0° K., is given. The heat of combustion at 25°/1 atm. of C_nH_{2n} ($n > 5$) is $21.90 + 157.00n \pm (0.10n - 0.10)$. F. L. U.

Heats of combustion of ethylene and propylene. F. D. ROSSINI and J. W. KNOWLTON (J. Res. Nat. Bur. Stand., 1937, **19**, 249—262).—The heats of combustion at 25°/1 atm. to form gaseous CO_2 and liquid H_2O are: C_2H_4 337.28 ± 0.07 ; C_3H_6 491.82 ± 0.15 kg.-cal. per mol. These vals. are respectively 1.6 and 0.4% > the hitherto accepted "best" vals. F. L. U.

T T (A., I.)

Determination of heats of combustion from refractive indices. M. M. SAMYGIN (J. Phys. Chem. Russ., 1937, **9**, 929—931). E. R.

Conductance of mixtures of strong electrolytes. K. A. KRIEGER and M. KILPATRICK (J. Amer. Chem. Soc., 1937, **59**, 1878—1883).—The conductivities of LiCl solutions have been measured at 25°, and the results compared with previous vals. The conductivities of 19 aq. LiCl-KCl mixtures are compared with theoretical vals. J. W. S.

Potential of the silver-silver thiocyanate electrode. J. N. PEARCE and L. SMITH (J. Amer. Chem. Soc., 1937, **59**, 2063—2065).—From e.m.f. measurements on cells of the types $\text{Ag}|\text{AgCNS}, \text{KCNS} (m)|\text{KHg}_2|\text{KCNS} (0.1m), \text{AgCNS}|\text{Ag}; \text{Ag}|\text{AgCNS}, \text{KCNS} (m)|\text{KCNS} (0.1m), \text{AgCNS}|\text{Ag};$ and $\text{Hg}|\text{Hg}_2\text{Cl}_2, \text{KCl} (0.1m)|\text{KCNS} (0.1m), \text{AgCNS}|\text{Ag}$ at 25° the transport no. of the K^+ ion in KCNS solutions has been calc. The electrode potential of $\text{Ag}|\text{AgCNS}, \text{KCNS} (m = 1)$ at 25° is -0.0947 v. J. W. S.

Liquid junction potentials for certain complex systems. A. L. FERGUSON, R. HITCHENS, and K. VAN LENTE (Trans. Electrochem. Soc., 1937, **72**, Preprint 20, 283—300).—Const. and reproducible boundaries can be obtained for the systems $\text{HCl} +$ either aq. NH_3 , glycine, glutamic acid, or NH_4Ph . The difference between the calc. and observed boundary potential vals. is $> 2\%$. J. W. C.

Electromotive forces of concentration chains in the fused state. S. A. PLETENEV and V. N. ROZOV (J. Phys. Chem. Russ., 1937, **9**, 854—866).— AgCl , PbCl_2 , CdCl_2 , and ZnCl_2 have been used as solvents with LiCl, KCl, CaCl_2 , and MgCl_2 as solutes in concn. chains. The e.m.f. is a linear function of the log of the mol. concn. of the solute. E. R.

A working electrode of pure carbon does not produce an electrolytic gas cell. V. SIHVONEN (Suomen Kem., 1937, **10**, B, 21).—An e.m.f. is developed with extreme slowness between perforated electrodes of purified graphite through which H_2 and O_2 are passed, the electrodes being immersed in an aq. solution. A graphite anode, whether in an aq. solution or molten NaOH, is not appreciably depolarised by a current of H_2 . F. L. U.

Sparks in electrolytic valve action. A. GÜNTHER-SCHULZE and H. BETZ (Z. Physik, 1937, **107**, 347—353).—The relationship between applied potential, current, time of "forming," and electrolyte concn. during valve action at a Ta electrode is examined, with special reference to the effect of gas bubbles on the sparking. L. G. G.

Electrolytic reduction potentials of organic compounds. XXIII. Reduction potential of quinoline. I. TACHI and H. KABAI (J. Electrochem. Assoc. Japan, 1935, **3**, 250—257).—The reduction of quinoline to dihydroquinoline has been studied with the dropping Hg cathode. Quinoline lowers the H overvoltage. From a comparison of the polarograms with those for quinine, the reduction of the latter appears to involve the quinoline nucleus.

CH. ABS. (e)

Oxidation-reduction potentials of hydroxynaphthaquinones in alkaline solutions. E. G. BALL (J. Amer. Chem. Soc., 1937, **59**, 2071—2072; cf. A., 1936, 1206; 1937, I, 246).—Phthiocol and lapachol in 1.0M-NaOH both give titration curves which are much steeper than those predicted on the basis of the two equiv. change. At p_H 13.5 the mid-point potentials of the titration curves are -0.555 and -0.568 v., respectively. This is in accord with the formation of semiquinones. J. W. S.

Oxidation-reduction potentials. IV. Substituted hydrazine- and diazo-sulphonates. G. HOLST (Z. physikal. Chem., 1937, **180**, 161—168; cf. A., 1937, I, 310).—The oxidation-reduction potentials, E , of $X \cdot C_6H_4 \cdot NH \cdot NH \cdot SO_3 \rightleftharpoons X \cdot C_6H_4 \cdot N \cdot N \cdot SO_3 + H_2$, where X is Cl or Me *o*, *m*, or *p* to the N, have been measured at 25°. The Cl-substituted systems have more positive and the Me-substituted systems more negative E than the unsubstituted system, and the effect of Cl substitution is > that of Me substitution. Measurements of the rate of the reaction methylene-blue + $X \cdot C_6H_4 \cdot NH \cdot NH \cdot SO_3 \rightleftharpoons X \cdot C_6H_4 \cdot N \cdot N \cdot SO_3 +$ leucomethylene-blue in 0.01N-HCl at 20° indicate that the velocity of the forward, but not that of the reverse, reaction changes with the p.d. of the systems. The change corresponds with a fall of 1.4 kg.-cal. in the activation energy for a variation of 0.03 v. in the p.d. It seems that the constitution of the functional chromophoric group of the H acceptor determines the dark reactivity. The relation of these results to Dimroth's theory (A., 1933, 1123) is examined, and a statistical interpretation of Dimroth's const. suggested. R. C.

Properties of metals in relation to the p_H scale, and the isopotential point. F. VLÈS (Congr. Corrosion, Monaco, 1937, separate, 5 pp.).—The "isopotential point" (P) of a metal in a salt solution is defined as the p_H val. at which the equilibrium potential is established immediately without preliminary change. Examples are given for Zn and Pb in aq. KCl. P is a characteristic of any given metal-salt solution system and is determined by the nature of the metal and the concn. of the salt. It is in several respects analogous to the isoelectric point of an ampholyte. F. L. U.

Significance and measurement of polarisation in the cathodic deposition of metals. F. MÜLLER (Z. Elektrochem., 1937, **43**, 812—821).—Present data and theories are summarised. The direct and commutator methods of measuring polarisation potential are described and the difficulty of obtaining reproducible measurements is discussed.

J. W. S.

Solutions of electrolytes showing no polarisation on electrolysis. V. S. FINKELSTEIN and P. V. USTJANOVA (J. Phys. Chem. Russ., 1937, **9**, 773—779).—The anodic and cathodic potentials of ICl₃ in Br, EtCO₂H, PhNO₂, and AsCl₃, of ICl in EtCO₂H and PhNO₂, and of PCl₃ and SbCl₃ in Br do not change with the c.d. In most cases, this can be explained by the assumption that electrolysis involves an exchange of electrons between the solute and the solvent; the solvent itself acts under these conditions as a depolariser. E. R.

Theory of limiting currents. I. Polarographic limiting currents. D. MACGILLAVRY and E. K. RIDEAL (Rec. trav. chim., 1937, **56**, 1013—1021).—The theory of the diffusion and limiting currents observed with the dropping Hg cathode (cf. A., 1935, 305) is examined critically, and the expressions for the limiting currents at growing and steady drops are compared. An approx. theory of the complete polarographic wave is deduced. The driving force and mobility of the reducible ion are discussed, better accord between experiment and theory being obtained when the proper ionic mobilities are employed. J. W. S.

Mechanism of electrolysis. V. SIIVONEN (Suomen Kem., 1937, **10**, B, 19—20).—Equations for the c.d. are derived both for the case where ionic discharge is the rate-determining process and for that in which an active depolariser is present. F. L. U.

Passivity of iron and steel in nitric acid solution. XXI. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, **16**, 1130—1148).—Agitation of the solution inhibits development of the passivity of an Fe anode during electrolysis of aq. HNO₃, probably owing to removal of the corrosion product from the surface. It is suggested that the development of passivity of the Fe is assisted by the presence of corrosion product because the chief component of the latter is Fe(NO₃)₂, which reacts with HNO₃ to yield HNO₂ and at. O. J. W. S.

Passivity of metals in relation to the theory of W. J. Müller. V. CUPR (Chem. Listy, 1937, **31**, 353—358).—A review.

Corrosion of iron in potassium iodide-iodine solution. G. V. AKIMOV (J. Phys. Chem. Russ., 1937, **9**, 493—501).—The current strength i and the potentials E of the systems (I) Pt|0.5N-KI|Fe and (II) Pt|0.5N-KI + I|Fe have been measured. For (II) i is 50—100 times that for (I). The e.m.f. of (II) is nearly const. but E for Fe and Pt falls suddenly owing to the activation of Fe by I. Addition of I to the cathode increases i , but has no effect at the anode. The corrosion of Fe in KI + I is an electrochemical process of the same kind as that which occurs in (II). J. J. B.

Standardisation of hydrogen ion determination. I. Hydrogen electrode measurements with liquid junction. D. I. HITCHCOCK and (Miss) A. C. TAYLOR (J. Amer. Chem. Soc., 1937, **59**, 1812—1818).—E.m.f. measurements have been made on cells of the type H₂|buffer solution|KCl (sat.), Hg₂Cl₂ (sat.)|Hg. Assuming the thermodynamic dissociation consts. of the acids, extrapolation of the data obtained with OAc', PO₄'', BO₂'', and glycolate buffer solutions yields a const. val. of E^0 (0.2441 v.) for the Hg₂Cl₂ half-cell. The same val. is obtained with aq. HCl + NaCl, but not with HCl alone or HCl + KCl. p_H vals. over the range 1—9 are assigned to a series of standard solutions, without correction for liquid junction potential, and can be used for exact determination of the thermodynamic dissociation consts. of weak acids from H₂ electrode measurements with buffer solutions containing the

acid and its Na salt, providing the is between 4 and 9. J. W. S.

Electrochemical investigation of potassium silicate hydrates. T. TAKETA, H. IRIE, and F. L. E. SHIBATA (J. Sci. Hiroshima Univ., 1937, A, 7, 327—334).—The transition point of the hydrates $K_2SiO_3 \cdot 4H_2O \rightarrow K_2SiO_3 \cdot 3H_2O$ is determined from e.m.f. data for the cell $K-Hg[K_2SiO_3 \cdot nH_2O, H_2O \text{ sat.}, HgO|Hg$ to be 21.9° . No other hydrates were observed between 0° and 50° . O. D. S.

Manometric determination of fermentation and equivalent carbonic acid in two-buffer systems.—See A., III, 483.

Role of radicals in gas reactions. H. SACHSSE (Z. Elektrochem., 1937, 43, 806, and Angew. Chem., 1937, 50, 847—854).—A lecture. J. W. S.

Investigating time-temperature effects on the properties of reactants. W. M. BREITMANN (Ind. Eng. Chem., 1937, 29, 1202—1206).—A theoretical expression to represent the dependence of the physical properties of the product of a polymerisation reaction as a function of temp. and time is derived. To a first approximation, any physical property of the product may be expressed as a function of $\int \theta dt$, where θ is the temp. in $^\circ C$. and t is the time, so that if the observed vals. of the property in question be plotted against the area of the temp.-time plot for the experiment, a curve will be obtained, from which the results of further experiments may be predicted in terms of the val. of $\int \theta dt$, or of the more complex unsimplified function. The practical application of the theory is illustrated with reference to the changes of d and of η during the boiling of linseed oil in the "rain" apparatus. R. C. M.

Kinetics of the thermal decomposition of isopropyl iodide. J. L. JONES and R. A. Ogg, jun. (J. Amer. Chem. Soc., 1937, 59, 1939—1942).—The velocity of thermal decomp. of Pr^iI at 565 — 609° is given by $-d(Pr^iI)/dt = k[Pr^iI]$, where $k = 1.59 \times 10^{13} \times e^{-42,900/RT}$. It is suggested that the mechanism of the decomp. is either $Pr^iI \rightarrow Pr^i + I$; $Pr^i + Pr^iI \rightarrow C_3H_8 + C_3H_6I$; $C_3H_6I \rightarrow C_3H_8 + I$; $M + 2I \rightarrow I_2 + M$; or $Pr^iI \rightarrow C_3H_6 + HI$; $HI + Pr^iI \rightarrow C_3H_8 + I_2$. J. W. S.

Kinetics of the pyrolysis of *n*-propyl iodide and *n*-butyl iodide. J. L. JONES and R. A. Ogg, jun. (J. Amer. Chem. Soc., 1937, 59, 1931—1939).—The velocity of thermal decomp. of gaseous Pr^iI at 584 — $627^\circ K$. can be expressed $-d(Pr^iI)/dt = k[Pr^iI][I_2]^{\frac{1}{2}}$. The mechanism of the reaction can be represented (a) $Pr^iI \xrightarrow{Pr^i + \frac{1}{2}I_2}$, (b) $Pr^i + I_2 \rightarrow Pr^iI + I$ (slow); and (c) $Pr^iI \rightarrow \frac{1}{2}C_3H_8 + \frac{1}{2}C_3H_6 + \frac{1}{2}I_2$ (rapid). From the strength of the bonds involved and the entropies of the reactions the equilibrium const. of reaction (a) is calc. as $1.22 \times 10^4 \times e^{-24,700/RT}$, and the velocity const. of reaction (b) as $1.79 \times 10^8 \times T^{\frac{1}{2}}e^{-12,600/RT}$. The decomp. of Bu^iI at 590 — 622° is similar to that of Pr^iI and is also catalysed by I_2 . J. W. S.

Kinetics of the explosive reaction between hydrogen and oxygen sensitised by nitrogen peroxide. G. VON ELBE and B. LEWIS (J. Amer.

Chem. Soc., 1937, 59, 2022—2025).—Kinetic analysis of the explosion of H_2 and O_2 sensitised by NO_2 eliminates the mechanism based on O atoms, and suggests mechanisms in which NO_3 , H, OH, and HO_2 participate. Equations are derived for the upper and lower crit. concns. of NO_2 which are in accord with experiment. J. W. S.

Carbon monoxide-oxygen flame. II. Influence of composition on the intensity of the visible luminosity of the flame. III. Absolute intensity of electronic emission of the flame. E. KONDRATEVA and V. KONDRATEEV (J. Phys. Chem. Russ., 1937, 9, 736—745, 747—751; cf. A., 1936, 1469).—II. With $p_{CO} = 40$ mm., the change in p_{O_2} from 20 to 360 mm. causes a decrease in luminosity which can be explained by a quenching of chemiluminescence with a quenching const. $K_{O_2} = 0.162 \text{ mm.}^{-1}$. With $p_{O_2} = 20$ mm., the change in p_{CO} from 40 to 180 mm. causes a quenching with the const. $K_{CO} = 0.034 \text{ mm.}^{-1}$. N_2 (0—440 mm.) causes a change in luminosity, indicating its influence on the mechanism of the reaction $CO + O_2$ (formation of N oxides).

III. One excited CO_2 mol. is formed per 125 mols. of CO_2 in the CO flame at $p = 100$ mm. and 740° . The concn. of CO_2 in the flame is the thermodynamical equilibrium val. E. R.

Kinetics of F_2O_2 decomposition. H. J. SCHUMACHER and P. FRISCH (Z. physikal. Chem., 1937, B, 37, 1—17).—The thermal decomp. between -60° and -25° under 2.5—400 mm. is a homogeneous and unimol. reaction, and $k_\infty = 5.9 \times 10^{12}e^{-17,300/RT}$. The graph of $1/k$ against $1/p$ where k is the velocity coeff. under pressure p is not linear if p is small, but the variation of k with p is quantitatively accounted for by the Rice-Ramsperger-Kassel theory, assuming that the no. of degrees of freedom is 6, the mol. diameter 7×10^{-8} cm., and q_0 17,300 g.-cal. Energy transfer apparently occurs at almost every collision of F_2O_2 mols. No indication of the existence of FO, even as a short-lived intermediate product, has been obtained. The reaction mechanism does not involve chains. R. C.

Thermal behaviour of F_2O_2 . Kinetics of the decomposition and influence of foreign gases. P. FRISCH and H. J. SCHUMACHER (Z. Elektrochem., 1937, 43, 807).—See A., 1937, I, 86, 624.

J. W. S.

Oxidation of propane. I. Products of slow oxidation at atmospheric and at reduced pressures. D. M. NEWITT and L. S. THORNES. II. Products of slow oxidation at high pressures. D. M. NEWITT and W. G. SCHMIDT. III. Kinetics of oxidation. D. M. NEWITT and L. S. THORNES (J.C.S., 1937, 1656—1665, 1665—1669, 1669—1676).—I. The distribution of O in the products has been determined by analysis and the formation of cool flames identified with the presence of a crit. concn. of higher aldehydes in the reacting medium. Conditions for the propagation of a succession of cool flames during the reaction of an equimol. $C_3H_8-O_2$ medium have been investigated.

II. At high pressures Pr^iOH and $COMe_2$ are formed, probably by direct oxidation of C_3H_8 at the β -C

atom. Pr°OH , EtOH , and MeOH are also formed in considerable quantities; the yield of the higher alcohols is favoured by increase of pressure. C_3H_8 appears to undergo oxidation in two ways, yielding as initial products Pr°OH and EtCHO , and Pr°OH and COMe_2 , respectively.

III. The surface and homogeneous reactions have been investigated separately; the influence of vessel diameter and of diluents on reaction rate is in accordance with the operation of a chain mechanism. Analytical and kinetic results indicate that the following intermediate stages, controlling the course and rate of combustion, occur: (1) an initiating process, which almost certainly starts as a surface reaction and gives rise to crit. concns. of a higher aldehyde, (2) a series of homogeneous reactions by which the higher aldehyde is reduced stepwise to CH_2O , (3) a reaction which occurs simultaneously with (2) and results in thermal decomp. of the aldehyde or of some intermediate product of its further oxidation. E. S. H.

Spectroscopic studies of reaction flames. I. Reaction flame of acetylene and halogen. II. Reaction flame of mercury and halogen. H. TOMINAGA and G. OKAMOTO (Bull. Chem. Soc. Japan, 1937, 12, 401—404, 404—408).—I. The reaction between C_2H_2 and halogen (Br and Cl_2) is examined spectroscopically and a chain mechanism $\text{Cl} + \text{C}_2\text{H}_2 \rightarrow \cdot\text{C}:\text{CHCl} + \text{H}$; $\text{H} + \text{Cl}_2 \rightarrow \text{HCl} + \text{Cl}$; $\cdot\text{C}:\text{CHCl} = \text{C}_{\text{gas}} + \text{C}_{\text{solid}} + \text{HCl}$, is postulated.

II. The reaction flame of $\text{Hg} + \text{Cl}_2 \rightarrow \text{HgCl}_2$ shows two bands $\lambda\lambda$ 5600 and 6700—5700 Å., and that of the reaction $\text{Hg} + \text{Br}_2 \rightarrow \text{HgBr}_2$ one band $\lambda\lambda$ 6700—4300 Å. The origin of the bands is discussed.

F. J. L.

Thermal decomposition of dioxan. L. KUCHLER and J. D. LAMBERT (Z. physikal. Chem., 1937, B, 37, 285—306; cf. A., 1936, 1208).—At 723—808° K. dioxan (I) decomposes chiefly into $2\text{CO} + \text{H}_2 + \text{C}_2\text{H}_6$, the reaction is of the order 3/2, and the velocity coeff. is given by $\log k = 13.65 - 58,500/(2.3RT)$. H_2 and N_2 have little influence on the velocity, even at low (I) pressures. Small amounts of NO retard powerfully, suggesting a chain mechanism. Attempts to detect H atoms by the $p\text{-H}_2$ method or to initiate chains with Me radicals formed by decomp. of CH_2N_2 failed. The following mechanism, according to which the chains are propagated by CH_3 radicals, accounts for the experimental observations: (I) $\rightarrow \text{CH}_2\text{O} + \cdot\text{CH}_2\text{CH}_2\text{O}\cdot$ (II) $+ \text{CH}_3$; (II) $\rightarrow \text{CH}_2\text{O} + \text{CH}_3$; (II) $\xrightarrow{\text{MeCHO}} \text{CH}_3 + \text{I} \rightarrow \text{CH}_2\text{O} + \text{C}_2\text{H}_4 + \text{II}$; $\text{CH}_2 + \text{CH}_2 + \text{M} \rightarrow \text{C}_2\text{H}_4 + \text{M}$; $\text{CH}_2 + \text{II} \rightarrow \text{CH}_2\text{O} + \text{C}_2\text{H}_4$. The energy of activation of the first step is 71,000 g.-cal.

R. C.

Inflammability limits of air-gas mixtures in contact with a hot point.—See B., 1937, 1155.

Steric factor in reactions in solutions. W. HUCKEL (Z. physikal. Chem., 1937, 180, 139—140).—A reply to criticism (A., 1937, I, 522). R. C.

Comparison of action of oxidising agents liberating iodine. O. I. ANDREEVA and B. B. VASILIEV (J. Chem. Ind. Russ., 1937, 14, 1097—1105).—The reaction of oxidation of NaI by KClO_3

or $\text{K}_2\text{Cr}_2\text{O}_7$ is bimol.; its velocity $\propto [\text{H}^+]$, temp., and $[\text{K}_2\text{Cr}_2\text{O}_7]$. The reactions with NaNO_2 , KMnO_4 , or $\text{Ca}(\text{OCl})_2$ are very rapid, and are not uni- or bimol. In the case of KMnO_4 excess of the reagent causes oxidation of part of the liberated I to oxyacids. The ranges of the reactions are: KClO_3 —1.5 to 0, $\text{K}_2\text{Cr}_2\text{O}_7$ 0—1, NaNO_2 1.75—2.5, KMnO_4 2.5—7, and $\text{Ca}(\text{OCl})_2$ 2.5—11. R. T.

Kinetics of the thermal decomposition of oxalic acid. E. SCHROER and (FRL.) A. DINGLINGER (Z. Elektrochem., 1937, 43, 808).—The decomp. of $\text{H}_2\text{C}_2\text{O}_4$ in aq. solution at 100—170° and in dioxan solution at 130—150° is homogeneous and of the first order. In H_2O the products are CO_2 , CO , HCO_2H , and H_2O , their proportions being almost independent of temp. In dioxan the products are CO_2 and HCO_2H . The reaction is unaffected by the presence of decomp. products, but H^+ has a catalytic effect. Salts affect the reaction only when acid oxalates are produced, as with $\text{K}_2\text{C}_2\text{O}_4$ and K_2SO_4 . The activation energy in dioxan is 29.45 kg.-cal., the same val. as in conc. H_2SO_4 . In H_2O it varies with temp. but converges towards the same val. as in dioxan at higher temp. The results with H_2O are interpreted on the basis of the unsymmetrical structure of the acid. The temp. coeff. of activation is related to the solvation of the acid at low temp. J. W. S.

Effect of heavy water on rate of hydrolysis of esters and on the equilibrium constant. A. KAILAN and F. EBENEDER (Z. physikal. Chem., 1937, 180, 157—160).—In the hydrolysis of EtOAc and EtOBz by H_2O at 205° the equilibrium const. is not materially altered by replacing the H_2O by D_2O , but the rate of hydrolysis is lowered considerably. This agrees with Bonhoeffer and Reitz's theory (A., 1937, I, 469). R. C.

Rates of exchange reactions of resorcinol and pyrogallol in heavy water. K. H. GEIB (Z. physikal. Chem., 1937, 180, 211—232; cf. A., 1936, 1104).—The exchange reactions between resorcinol (I) and D_2O , deuterioresorcinol (II) and H_2O , and deuteropyrogallol (III) and H_2O have been studied. At 230° only 5 H in (I) are exchangeable; the $m\text{-H}$ is not exchanged. The rate of exchange of D atoms 4 and 6 in (II) catalysed by H^+ is given by $\log k = 11.5 \pm 0.5 - (20,500 \pm 700)/(2.3RT)$, and at 65° the rate of exchange of H^+ ions in H_2O for D in (II) is 1—1.4 times as great as that of D^+ ions in D_2O for H in (I); the exchange thus resembles the acid-catalysed mutarotation of glucose. The rate of exchange of the third nuclear H is 6.7 times smaller. In alkaline solution the exchange is a complex process. OAc^+ ions, but not AcOH , catalyse the exchange. In neutral solution the rate of exchange is independent of the (I) concn. In (III) D atoms 4 and 6 are exchanged at the same rate at 65° in presence of H^+ ions as catalyst, and the third nuclear D is exchanged 2000 times more slowly, apparently owing to a higher energy of activation. R. C.

Kinetics of aldol condensation. R. P. BELL (J.C.S., 1937, 1637—1640).—Dilatometric measurements show that the condensation of MeCHO to aldol in 0.0005—0.03N- NaOH is a reaction of the

first order with respect to MeCHO when correction is made for the further slow condensation of the aldol. The rate-determining step is probably the formation of free MeCHO from $\text{CHMe}(\text{OH})_2$, which is catalysed by OH' and H_2O ; this view is supported by the variation of reaction velocity with $[\text{OH}']$. The catalytic power of aq. Na_2CO_3 is due to the OH' content.

E. S. H.

Mechanism of sulphonation of aromatic compounds and the hydrolysis of their sulphonic acids.—See A., II, 490.

Autoxidation processes. X. Oxidation of desylamine and benzoin methyl ether. T. H. JAMES and A. WEISSBERGER (J. Amer. Chem. Soc., 1937, 59, 2040—2042).— $\text{COPh}\cdot\text{CHPh}\cdot\text{NH}_2$ (I) is oxidised (method: A., 1929, 1301) by O_2 in aq. KOH about 1.75 times as fast as benzoin, the rate being \propto the concn. of (I) and to $[\text{OH}']$. Benzil (II), H_2O_2 [identifiable when $\text{Ba}(\text{OH})_2$ is the alkali used], and NH_3 are the initial products; BzOH is subsequently formed from the H_2O_2 and (II). (I) is oxidised by Fehling's solution to (II). Benzoin Me ether also undergoes autoxidation; the rate is about 0.005 of that of benzoin. The limiting process in all the autoxidations is the rate of dissociation of H' from the C to which is attached the OH, NH_2 , or OMe group.

H. B.

Active oxides. CVIII. Rate of dissolution in various solvents of aluminium oxides formed by heating basic aluminium acetate in presence of different gases. G. F. HUTTIG and E. R. KURSCHNER (Kolloid-Z., 1937, 81, 40—45; cf. A., 1937, I, 363).—The rate of dissolution of Al_2O_3 prepared by heating $\text{Al}(\text{OH})(\text{OAc})_2\cdot\text{H}_2\text{O}$ at 600° in air, N_2 , SO_2 , $4\text{NO}_2 + \text{O}_2$, NH_3 , H_2O , and Ac_2O exhibits marked differences, depending on the gas used, and on the solvent chosen (aq. H_2SO_4 , HNO_3 , AcOH).

F. L. U.

Reactions between solid substances. I. Kinetics of reactions of polycrystalline substances. B. V. EROFEEV (J. Phys. Chem. Russ., 1937, 9, 828—853).—Six possible cases of reaction kinetics in systems containing one solid component before and after the reaction (e.g., allotropic changes, dehydration of salts, etc.) are considered theoretically.

E. R.

Reduction of chromium oxide. R. H. GRIFFITH, S. G. HILL, and J. H. G. PLANT (Trans. Faraday Soc., 1937, 33, 1419—1425).—The rate of reduction of hydrated Cr_2O_3 with H_2 , C_6H_{14} , cyclohexane, C_6H_6 , and decahydronaphthalene at 350 — 450° has been measured. With hydrocarbons the extent and velocity of reduction are $>$ with H_2 . The hydrocarbon mol. is completely broken down, CO_2 being formed. Activated adsorption of the reducing agent precedes reduction. The adsorption of C_6H_6 on the oxide reduced in H_2 is of the van der Waals type up to 300° . Activated adsorption occurs at 350° and decomp. of the C_6H_6 occurs at 375° . Adsorption of C_6H_6 is less after reducing the oxide in C_6H_{14} than in H_2 . A modified McLeod gauge suitable for accurate pressure determinations with a condensable vapour is described.

H. J. E.

Rate of dissolution of bivalent rhombohedral carbonates in acids. A. FERRARI and L. SESSA (Gazzetta, 1937, 67, 501—510).—Measurements of the rate of dissolution of the carbonates of Ca, Cd, Mn, Zn, Co, and Mg and of certain natural carbonates (rhodochrosite, smithsonite, dolomite, siderite, magnesite) in 8% HCl and in 60% HClO_4 have been made. In general, the rate of dissolution decreases rapidly with decreasing radius of the bivalent cation.

O. J. W.

Reactivity of binary alloys. I. C. GORIA and G. VENTURELLO (Gazzetta, 1937, 67, 487—501).—The reactivity of binary alloys with H_2O vapour at high temp. has been studied for the systems Al—Mg, Al—Fe, Al—Be, and Cu—Mg. The amount of reaction was found by measuring the increase in wt. of the powdered alloy after exposure to H_2O vapour under standard conditions, and was also followed qualitatively by means of photomicrographs. The reactivity of intermetallic compounds is markedly different from, and generally $<$, that of solid solutions or of mixtures.

O. J. W.

Kinetics of silicate formation in the system CaO-SiO_2 . P. S. MANIKIN and S. G. ZLATKIN (J. Phys. Chem. Russ., 1937, 9, 393—406).—Ignition of equimol. mixtures of CaO and SiO_2 at 800° , 1200° , and 1400° affords chiefly $2\text{CaO}\cdot\text{SiO}_2$ and $3\text{CaO}\cdot 2\text{SiO}_2$, the amount of the latter compound rising with temp. and time (up to 3 hr.). In 3 hr. no formation of $\text{CaO}\cdot\text{SiO}_2$ occurs. A mixture of 1 mol. of CaO and 25 mols. of SiO_2 at 1200° gives mainly $3\text{CaO}\cdot 2\text{SiO}_2$; its amount increases in agreement with Jander's theory (A., 1928, 256).

J. J. B.

Application of Hahn's emanation method to investigation of reactions in solid state. IV. Kinetics of calcium silicate formation. R. JAGITSCH (Z. physikal. Chem., 1937, B, 36, 339—346; cf. A., 1936, 1210).—The rate of reaction, dy/dt , between CaO and pptd. SiO_2 at 775 — 1091° is given by $-dy/dt = k/y$, where y is the thickness of the reaction layer and k is a const., and the emanating power, E , $\propto (1/y)$, so that $\log_e E = -kt + \text{const.}$ The graph of $\log E$ against t consists of two straight lines, which is interpreted as meaning that at first, the rate of reaction is determined by the rate of the surface reaction and later by the rate of diffusion of CaO mols. through the product. In both stages the energy of activation is 23.2 kg.-cal. With rise of temp. the velocity increases abruptly at 940° owing to transformation of α -quartz into tridymite.

R. C.

Reactions in the solid state. I. Reactions between barium carbonate and ferric oxide in the presence of oxygen. R. WARD and J. D. STRUTHERS (J. Amer. Chem. Soc., 1937, 59, 1849—1854).—The rates of reaction of $\text{BaCO}_3 + \text{Fe}_2\text{O}_3$ mixtures in a current of O_2 have been measured at 610 — 970° , and the Fe in the product sol. in dil. HCl has been determined. The mol. ratio sol. $\text{Fe}:\text{Ba}$ decreases with rising temp., and indicates that either $\text{Ba}_2\text{Fe}_2\text{O}_5$ (I) is the product at higher temp. and both (I) and $\text{Ba}(\text{FeO}_2)_2$ at lower temp., or that a solid solution of Fe_2O_3 in (I) is produced at lower temp. The heats of activation of BaCO_3 below and above

the transition point are 25,000 and 19,000 g.-cal. per mol., respectively. The mechanism of the reaction involves diffusion of BaCO_3 through the reaction products. When the ferrites are heated in O_2 at $>700^\circ$, oxidised Fe compounds are formed, the optimum temp. for their production being $835\text{--}880^\circ$, above the reported range of stability of Ba per ferrite (A., 1910, ii, 36). No BaO_2 could be detected in the reaction products. J. W. S.

Determination of detonation velocity of explosives.—See B., 1937, 1279.

Combustion and detonation of solid explosives.—See B., 1937, 1278.

Velocity of combustion of colloidal powders under atmospheric pressure.—See B., 1937, 1278.

Combination of sugars with amino-acids. II.—See A., II, 483.

Kinetics of coagulation of latex of *Hevea brasiliensis*.—See B., 1937, 1244.

Effect of oxygen, fluorine, nitrogen, argon, helium, and carbon dioxide on the rate of decomposition of F_2O_2 . P. FRISCH and H. J. SCHUMACHER (Z. physikal. Chem., 1937, B, 37, 18—24).—From the increase in the velocity coeff. caused by these gases the probabilities of their activating F_2O_2 have been calc. R. C.

Kinetics of the dry and water-catalysed reaction between carbon monoxide and oxygen at and above the upper explosion limit. G. VON ELBE and B. LEWIS (J. Amer. Chem. Soc., 1937, 59, 2025—2029).—Chain mechanisms are proposed for the dry and H_2O -catalysed reactions between CO and O_2 at and above the upper explosion limit. At this limit the reaction depends on $\dot{\text{O}}$ and O_3 as chain carriers, whilst the catalytic effect of H_2O above the limit is attributed to a chain-initiating mechanism. J. W. S.

Catalytic transfer in the isotopic exchange of bromine. N. BRESHNEVA, S. ROGINSKI, and A. SCHILINSKI (J. Phys. Chem. Russ., 1937, 9, 752—754).—The exchange of radioactive Br between different alkyl bromides (EtBr , $\text{C}_2\text{H}_4\text{Br}_2$, $\text{C}_5\text{H}_{11}\text{Br}$, and CHBr_3) was measured (a) in presence of AlBr_3 and (b) in its absence. No transfer occurs in 45 min. in case (b), and a considerable transfer in case (a). Radioactivity of the AlBr_3 after the exchange shows that the mechanism of the catalysed reaction consists in an exchange of Br atoms between the two alkyl bromides and AlBr_3 . E. R.

Ozone as oxidising catalyst. IX. Analysis of very dilute ozone. IV. Study of reactions by the amount of oxygen absorbed. E. BRINER and E. PERROTTET (Helv. Chim. Acta, 1937, 20, 1207—1213).—Comparison of the static and dynamic methods of determining the catalytic effects of O_3 on the oxidation of aldehydes indicates that, although similar, the results by the static method are less regular and reproducible. J. W. S.

Amorphous and crystallised oxide hydrates and oxides. XXXVII. Acceleration of the air-oxidation of ferrous hydroxide by lead ions or lead hydroxide, and the effect of these in directing

and stabilising the lattice. A. KRAUSE, Z. ERNST, and T. GRZEŚKOWIAK (Z. anorg. Chem., 1937, 234, 51—58).—When $\text{Fe}(\text{OH})_2$ in presence of aq. NH_3 is oxidised by air, the % of Fe^{III} in the product is much increased by small amounts of Pb^{++} or $\text{Pb}(\text{OH})_2$. With larger amounts of Pb the oxidation is complete and the product has the structure of $\alpha\text{-FeO}\cdot\text{OH}$ or, under certain conditions, of $\gamma\text{-FeO}\cdot\text{OH}$. As the amount of Pb increases the products become more finely divided, and with still larger amounts of Pb amorphous products are obtained. The presence of Pb also hinders the change of γ - to $\alpha\text{-Fe}_2\text{O}_3$. F. J. G.

Catalytic oxidation of iodides by persulphates.

I. Mechanism of the oxidation. II. Homogeneous catalysis of the reaction by organic catalysts. P. V. AFANASIEV (J. Phys. Chem. Russ., 1937, 9, 559—567, 568—574).—I. The reactions $\text{K}_2\text{S}_2\text{O}_8 + \text{KI}$ (i) and $\text{K}_2\text{S}_2\text{O}_8 + \text{BaI}_2$ (ii) are of the second order; that of $\text{K}_2\text{S}_2\text{O}_8$ and BaI_2 in presence of $\text{Na}_2\text{S}_2\text{O}_3$ is of the first order. The rate is deduced from conductivity measurements. (ii) is quicker than (i). The influence of admixtures on (ii) in presence of $\text{Na}_2\text{S}_2\text{O}_3$ is determined by measuring the time before appearance of free I. This time, τ , is decreased by $\text{Ba}(\text{NO}_3)_2 > \text{Al}(\text{NO}_3)_3 > \text{KNO}_3 > \text{NH}_4\text{NO}_3 > \text{NaNO}_3 > \text{glucose}$.

II. The second method is used for determining the influence of amines on reaction (i) in presence of $\text{Na}_2\text{S}_2\text{O}_3$ and HCl . τ is decreased by $p\text{-NMe}_2\cdot\text{C}_6\text{H}_4\cdot\text{NH}_2 > p\text{-C}_6\text{H}_4(\text{NH}_2)_2 > \text{NH}_2\cdot[\text{CH}_2]_5\cdot\text{NH}_2 > \text{NH}_2\cdot[\text{CH}_2]_2\cdot\text{NH}_2 > \text{NH}_2\text{Ph} > \text{N}_2\text{H}_4 > p\text{-NH}_2\cdot\text{C}_6\text{H}_4\cdot\text{OH}$ etc. J. J. B.

Catalytic activation of hydrogen. B. FARKAS and L. FARKAS (Tech. Kurir, 1937, 8, 77—79).—A lecture. E. P.

Preparation of oxide catalysts by deposition of aerosols. I. Catalytic activity of cupric oxide deposited from an aerosol. P. BESALOV and N. KOBOZEV (J. Phys. Chem. Russ., 1937, 9, 815—827).—Catalytically active CuO was obtained from an aerosol and its activity in oxidising CO has been investigated at $30\text{--}400^\circ$. The oxidation begins at $200^\circ <$ with an ordinary CuO powder. The reaction velocity on the aerosol obeys Arrhenius' law (activation energy 32.2 kg.-cal.). Activity of the aerosol increases with temp.; at 250° it is 765 times as active as the CuO powder. X-Ray photographs and photomicrographs show that the aerosol has the same structure as the powder, but smaller crystallites, which decrease further after catalysis. The aerosol absorbs twice as much air as the CuO powder, and 2.8 times as much after catalysis. E. R.

Surface area of mixed catalysts and changes in it caused by reactions in the solid state. K. STARKE (Z. physikal. Chem., 1937, B, 37, 81—104).—The surface area of oxide catalysts has been assessed, using the radioactive indicator method, by determining the amount, m , of $\text{Pb}(\text{NO}_3)_2$ adsorbed from MeOH solution at 25° at adsorption saturation. For $\text{Fe}_2\text{O}_3\text{--ZnO}$ and $\text{Cr}_2\text{O}_3\text{--ZnO}$ mixtures heated at moderate temp. m is the sum of the vals. for the separate oxides, an effect ascribed to the formation of adsorption compounds at the interface between the components

(cf. A., 1935, 944). This kind of surface activation seems to be accompanied by an increase in the sorption of inorg. mols. and ions, but not in that of dyes. It occurs to an appreciable extent only when the surfaces have active centres, and it is hindered by recrystallisation. At higher temp. diffusion becomes possible and a layer of non-cryst. reaction product is formed at the interface, and the sorptive power for dyes increases. With crystallisation of the product the sorptive power falls. In the system $\text{Fe}_2\text{O}_3\text{--ZnO}$ reaction to form ZnFe_2O_4 does not affect m . When $\text{Cr}_2\text{O}_3\text{--ZnO}$ mixtures are heated in air m increases owing to the formation of ZnCrO_4 , whilst by heating in H_2 there is an increase in m due to the formation of active intermediate products preceding the formation of ZnCr_2O_4 . R. C.

Reaction of sulphur dioxide with carbon disulphide and carbon oxysulphide. A. V. AVDEEVA (J. Chem. Ind. Russ., 1937, 14, 1077—1082).—The reactions $\text{CS}_2 + \text{SO}_2 \rightarrow \text{CO}_2 + 3\text{S}$ and $2\text{COS} + \text{SO}_2 \rightarrow 2\text{CO}_2 + 3\text{S}$ proceed practically to completion when the gas mixture is passed over a slag- Al_2O_3 cement catalyst activated with bauxite, at 400—450°. The activity of the catalyst falls when it is heated at >700°, or when $\text{Fe}(\text{OH})_3$ is added to it. The catalyst does not undergo inactivation while in use, but later exposure to the air brings about reversible inactivation, due to formation of a surface film of sulphates. R. T.

Reactions in concentrated sulphuric acid. IX. Kjeldahlisation in presence of various gases. J. MILBAUER (Chem. Obzor, 1937, 12, 17—19).—The acceleration of the oxidation of sucrose in conc. H_2SO_4 at 302° and normal pressure with the passage of air alone, and in the presence of HgSO_4 , Ag_2SO_4 , CuO , SeO_2 , and TeO_2 , individually and in binary and ternary mixtures, is described. Acceleration is noted also with O_2 , and ozonised air and O_2 , in presence of the above catalysts. Oxidation was quickened with the passage of H_2 and SO_2 individually or in the presence of the above catalysts, except TeO_2 with H_2 and Ag_2SO_4 with SeO_2 . N_2 and CO_2 aid the oxidation only by their motion, and Cl_2 , which is very effective generally, gives, in the presence of SeO_2 , the most rapid oxidation. F. R.

Catalytic action of $\text{Fe}(\text{OH})_3$ on oxidation of SO_2 to SO_3 by atmospheric oxygen. M. TALINA (J. Phys. Chem. Russ., 1937, 9, 421—430).—At 130° and with 10 vols. of air to 1 vol. of SO_2 , the best results are obtained. At low gas velocities dried $\text{Fe}(\text{OH})_3$ sol, and at high velocities $\text{Fe}(\text{OH})_3$ adsorbed by pumice-stone, are most active. Old sols are less active than fresh ones. The activity of $\text{Fe}(\text{OH})_3$ catalysts falls after use for 10 min. The recovered catalyst is less sol. than the fresh one. J. J. B.

Vanadium-thallium catalyst.—See B., 1937, 1199.

Preferential reduction of certain fatty acid groups during hydrogenation of natural fats.—See B., 1937, 1235.

Catalytic purification of nitrogen-hydrogen mixtures from organic sulphur.—See B., 1937, 1200.

Catalytic reduction of azo-dyes.—See B., 1937, 1180.

Rôle of catalysis in textile chemistry.—See B., 1937, 1194.

Electrolytic production of heavy water. Relation between current density and isotope separation coefficient. T. NOGUCHI (J. Electrochem. Assoc. Japan, 1935, 3, 305—310).—Data for the concn. of D_2O in 20% NaOH solution at 18° with Ni electrodes and a c.d. of 0.05—1.0 amp. per sq. cm. are recorded. The separation coeff. is not greatly affected by the c.d. CH. ABS. (e)

Electrolytic separation factor of deuterium at very low concentrations. H. F. WALTON and J. H. WOLFENDEN (J.C.S., 1937, 1677—1679).—Repetition of published work (A., 1936, 298) gives separation factors of 6.5—8, which are not significantly different from those obtained at higher $[\text{D}_2\text{O}]$ with the same cells. E. S. H.

Electrolytic separation of tungsten from aqueous solutions. A. GLAZUNOV and V. JOLKIN (Chem. Listy, 1937, 31, 309—313, 332—335).—Bright metallic deposits of W form on the cathode in the electrolysis of alkali tungstates, at >80°; at <80° the deposit consists of lower oxides of W. Electrolysis of strongly acid solutions was not possible, owing to pptn. of WO_3 , whilst in feebly acid ones lower oxides are deposited. R. T.

Rule governing the electrocrystallisation of metals. A. T. VAGRMIAN and S. A. ALEMIAN (J. Phys. Chem. Russ., 1937, 9, 517—521).—The no. of Ag crystals deposited on a Pt cathode from AgNO_3 solution was measured at various concns., c , of AgNO_3 . The most probable no. inversely $\propto c$ within the range 2N to 0.1N. J. J. B.

Influence of electrolyte concentration on the number of crystallisation nuclei formed during electrolysis. A. T. VAGRMIAN (J. Phys. Chem. Russ., 1937, 9, 511—516).—Deposition of Ag on a Pt cathode is observed under the microscope. At a const. c.d. of 10^{-4} amp. per sq. cm. the no. of Ag crystals increases with decreasing concn. of AgNO_3 (1.5 to 0.023N); in 0.023N- AgNO_3 all the crystals formed, but in 1.5N- AgNO_3 only a few of them grow further. At a const. p.d. the c.d. in 3N- AgNO_3 increases more rapidly than in 0.023N- AgNO_3 . J. J. B.

Place of discharge in electrochemical exchange without local action. Comparison of platinum surfaces from different sources in respect of their activity for hydrogen and for hydrogen peroxide catalysis. O. ERBACHER (Z. physikal. Chem., 1937, 180, 141—153; cf. A., 1937, I, 84).—The ratio between the surface areas of two samples of Pt foil, one smooth, the other roughened, determined by measuring their activity in catalysing the decomp. of aq. H_2O_2 was equal to the ratio of the amounts of Bi deposited on them by electrochemical exchange when they were charged with H_2 and brought in contact with a solution of a Bi salt. It is inferred that in electrochemical exchange without local action the electrons set free from the atoms passing into solution

are taken up at the point where dissolution occurs by the ions coming out of solution. R. C.

Kinetics of the quinhydrone electrode reaction. R. ROSENTHAL, A. E. LORCH, and L. P. HAMMETT (J. Amer. Chem. Soc., 1937, **59**, 1795—1804).—The relative catalytic properties of various forms of Pt and other surfaces for the oxidation and reduction of quinhydrone (I) have been investigated. The effects of addition of benzoquinone and p -C₆H₄(OH)₂ and of (I) concn. and [H⁺] on the anode c.d., when a const. p.d. is applied to electrodes in the solution, have been examined. From examination of possible mechanisms it is concluded that the anode reaction is complex and involves several parallel paths. J. W. S.

Electrolytic formation of persulphate. IV. Influence of temperature. R. MATSUDA, H. KONYA, and T. NISHIMORI (Bull. Chem. Soc. Japan, 1937, **12**, 425—432; cf. A., 1936, 436; 1937, **1**, 37, 525).—7N-(NH₄)₂SO₄ and 10, 15, 20, 25, 30, and 36N-H₂SO₄ have been electrolysed at 5°, 10°, and 25° with c.d. 5, 10, 20, 40, and 80 amp. per sq. dm. The current efficiency (calc. as total peroxidic O) is increased in the first three solutions on lowering the temp. and increasing the c.d. In 20N-H₂SO₄ the influence of temp. is the same at low c.d. and opposite above 40 amp. per sq. dm. H₂S₂O₈ is formed by oxidation of H₂SO₄ with anodic O₂. F. J. L.

Electrochemical protection of iron from corrosion in alkalis.—See B., 1937, 1213.

Electrolytic reduction of Chile saltpetre for production of ammonia.—See B., 1937, 1198.

Electrolytic reduction of glycollic acid and lactic acid.—See A., II, 482.

Oxidation of graphite in the glow discharge. R. NASANEN (Suomen Kem., 1937, **10**, B, 24).—Graphite used as cathode in a glow discharge in O₂ yields CO₂ and CO. The current yield is 8 mol. per faraday when the O₂ pressure is <0.2 mm.; it falls with increasing pressure, and is independent of voltage between 370 and 1500 v. Under otherwise identical conditions the same equilibrium mixture of CO₂ and CO is produced when the vessel is filled initially with O₂, CO₂, or CO. When graphite is used as anode the product is CO₂ only, and the current yield is >1.5 mol. per faraday. F. L. U.

Chemical effects of electrical discharge. K. R. DIXIT (Current Sci., 1937, **6**, 163—180).—A review.

Photochemical investigations in the Schumann ultra-violet. III. Further development of low-voltage xenon lamp. Quantum yields of photochemical gas reactions in the wave-length region below 1500 Å. **IV. Photochemical oxidation of carbon monoxide, and carbon monoxide as sensitizer.** W. GROTH (Z. physikal. Chem., 1937, **B**, **37**, 307—314, 315—322).—The Xe lamp (A., 1936, 1215) has been further improved by combination with a fluorspar vac. spectrograph and the partition between the resonance lines at 1295 and 1470 Å. of the total intensity in the extreme ultra-violet determined. The quantum yield for the formation of O₃ by these λλ is 1.90±0.05, that of CO₂ + hν = CO + O 0.98 per CO₂ mol. and 1.47 per CO and O₂

mol., and that of the decomp. of NH₃ 0.17±0.02. The amount of O₃ formed on irradiating O₂-N₂ and O₂-A mixtures is a max. when the O₂ content ~4%.

IV. The amounts of O₃ and CO₂ formed when streaming mixtures of CO with varying small amounts of O₂ are irradiated with light of the above λλ have been determined. For the formation of CO₂ by O + CO + M = CO₂ + the collision efficiency is 1/40. Experiments on the irradiation of H₂-CO mixtures showed the CO to sensitise the formation of CH₂O and (CHO)₂ from CO and H atoms, 0.5 ·CHO group being formed for each quantum absorbed by CO. (CHO)₂ and CH₂O are also formed on irradiation of CO-CH₄ mixtures, ~0.1 ·CHO group being produced for each quantum absorbed. R. C.

Release of electrical charges from photographic plates and other materials under moderate pressure. K. PROSAD and L. M. CHATTERJEE (Indian J. Physics, 1937, **11**, 289—294).—Photographic plates enclosed in envelopes of black paraffined paper have been subjected to pressures <3.3 × 10⁶ dynes per sq. cm. The electrical charges produced are due mainly to the envelope; the ejection of electrons from the photographic plate could not be ascertained. F. J. L.

Dependence of the Herschel effect on the surrounding gas medium. A. S. VNUKOVA (J. Phys. Chem. Russ., 1937, **9**, 598—604).—The Herschel effect in vac., in N₂, and in CO₂ is insignificant; it is strong in O₂, especially so in H₂O vapour, and negative in H₂. After short exposure of the plate the effect is always negative. J. J. B.

Silver nucleus theory of the latent image. Critical nuclear size. W. REINDERS and R. W. P. DE VRIES (Rec. trav. chim., 1937, **56**, 985—999; cf. A., 1932, 821; 1933, 359).—The physical development of Ag films prepared by sublimation in a vac. can be carried out only when the mean film thickness (t) is >0.002 atom. The readiness of development increases very rapidly with increasing t . For normal conditions of development only aggregates containing <4 atoms are capable of forming nuclei.

J. W. S.

Mass and distribution of photolytic silver in silver bromide-gelatin emulsions of different grain size. II. Mass and distribution of photolytic silver in photographic films containing nitrite. W. MEIDINGER (Physikal. Z., 1937, **38**, 737—747; cf. B., 1937, 1136).—The surface Ag and that formed within the emulsion were separately determined for different exposures and [NO₂']. The curve of "internal" Ag against light intensity reaches a limiting val., but the curve of surface Ag is linear. With increasing [NO₂'] the amount of photolytic Ag is greatly increased, particularly in the surface. A. J. M.

Photolyses with zinc sulphide. K. GLOOR (Helv. Chim. Acta, 1937, **20**, 853—877).—Dyes such as phenosafranine, methylene-blue, alizarin-direct-green, and Janus-green inhibit the photochemical blackening of ZnS. The ZnS, however, acts as a sensitizer for the photolysis of the dyes to their oxidation products and leuco-bases in ultra-violet light. The addition of CdS causes the photolysis

to occur also in visible light. Salts of heavy metals of variable valency (Co^{II} or Fe^{III}) also inhibit the photolysis of ZnS , but the latter is accelerated by the presence of other Zn salts. The results are in accord with Baur's theory of sensitised photolysis.

J. W. S.

Foundations of the theory of Lippmann's colour photography. K. F. LINDMAN (Z. tech. Physik, 1937, 18, 25—29).—The reflexion and phase change on reflexion of electric waves of λ 25 cm. by finely divided metallic particles dispersed in non-reflecting films (papier maché, shellac) have been measured. The absorption and reflecting power of sand for 25-cm. waves are increased by the addition of fine metal shot, whilst n is slightly decreased. Results disagree with Schütt's theory of Lippmann's colour photography.

O. D. S.

Photochemical chlorination of ethylene compounds and the influence of oxygen thereon. K. L. MÜLLER and H. J. SCHUMACHER (Z. Elektrochem., 1937, 43, 807—808).—The photochemical chlorinations of *cis*- and *trans*- $\text{C}_2\text{H}_2\text{Cl}_2$ occur with equal quantum yield (about 7×10^3 at $p_{\text{Cl}} - 100$ mm. and $I_{\text{abs.}} = 10^{16}$ quanta per min.) and follow the same velocity law $d[\text{C}_2\text{H}_2\text{Cl}_4]/dt = I_{\text{abs.}}[\text{Cl}_2]k_3/\sqrt{k_4}$ in accord with the mechanism: (1) $\text{Cl}_2 + h\nu = 2\text{Cl}$, (2) $\text{C}_2\text{H}_2\text{Cl}_2 + \text{Cl} = \text{C}_2\text{H}_2\text{Cl}_3$, (3) $\text{C}_2\text{H}_2\text{Cl}_3 + \text{Cl}_2 = \text{C}_2\text{H}_2\text{Cl}_4 + \text{Cl}$, (4) $2\text{C}_2\text{H}_2\text{Cl}_3 = \text{C}_2\text{H}_2\text{Cl}_4 + \text{C}_2\text{H}_2\text{Cl}_4$. The temp. coeff. indicates a total energy of activation of 3.1 kg.-cal. per mol., attributable to reaction (3). Traces of O_2 suppress the reaction completely. The chlorination of C_2HCl_3 follows the same law and reaction mechanism, but the quantum yield is only one twelfth of that with $\text{C}_2\text{H}_2\text{Cl}_2$, and the energy of activation is 5.3 kg.-cal. per mol. In this case O_2 suppresses chlorination almost completely, and sensitised oxidation occurs with quantum yield 40 and of zero order with respect to $[\text{O}_2]$ and $[\text{C}_2\text{HCl}_3]$. The reaction proceeds through C_2HCl_4 radicals and, probably, a peroxide product, to $\text{CHCl}_2\cdot\text{COCl}$.

Photobromination of acetylene dichloride in the gaseous phase. J. C. GHOSH, S. K. BHATTACHARYYA, and M. L. NARASIMHA MURTHI (J. Indian Chem. Soc., 1937, 14, 425—434).—The reaction has been studied in light of λ 546 m μ , and appears to follow the same mechanism as in λ 436 m μ . (A., 1936, 688). In the present case, however, the ratio of the velocity coeffs. in the vapour phase and CCl_4 solution is 47, compared with 32 for λ 436 m μ .

F. L. U.

Photolysis of azomethane. II. Effect of temperature. M. BURTON, T. W. DAVIS, and H. A. TAYLOR (J. Amer. Chem. Soc., 1937, 59, 1989—1993; cf. A., 1937, I, 419).—The rate of photolysis and nature of the products have been determined at 20—223°. The amount of N_2 produced is always > that of hydrocarbons, the excess being a max. at about 200°. The amount of CH_4 produced increases, and the amount of C_2H_6 produced decreases, with rise of temp. The amount of higher hydrocarbon (C_3H_8 ?) increases with rise of temp. The amounts of H_2 and unsaturated compounds produced are negligible. The results support the view that there is a secondary

association reaction between Me radicals and $(\text{MeN})_2$. On the basis of these results the lit. data for quantum yield in this reaction are recalc. and doubt is cast on the conclusion that the temp. coeff. is zero at <226°. The results also indicate that estimates of the lengths of chains initiated by $(\text{MeN})_2$ can only be min. vals.

J. W. S.

Photolysis of aliphatic aldehydes. IV. *n*- and *iso*-Butaldehydes. P. A. LEIGHTON, L. D. LEVANAS, F. E. BLACET, and R. D. ROWE (J. Amer. Chem. Soc., 1937, 59, 1843—1849).—The photochemical decomp. of both Pr^nCHO and Pr^iCHO vapours at 30° is analogous to that of MeCHO (A., 1933, 682), comprising both polymerisation and decomp., the quantum yields of which have been studied at $\lambda\lambda$ 2537—3130 Å. and at various pressures. At 400—550° K. chain reactions occur with both compounds, that for Pr^nCHO being similar to the reaction for MeCHO , whilst the behaviour of Pr^iCHO is more complicated.

J. W. S.

Theory of assimilation. I, II.—See A., III, 500.

Formation of water and hydrogen peroxide at low pressures. W. H. RODEBUSH, C. W. J. WENDE, and R. W. CAMPBELL (J. Amer. Chem. Soc., 1937, 59, 1924—1931; cf. A., 1937, I, 254).—The reaction between the dissociation products of H_2O (produced by rapid passage of H_2O vapour through an electrodeless discharge) has been examined at low pressure. H_2O is formed by two different homogeneous reactions, one of which is $\text{H} + \text{OH} + M \rightarrow \text{H}_2\text{O} + M$. The reaction between H atoms and O_2 may involve intermediate formation of H_2O_2 but none could be detected in the gas phase. The heterogeneous reaction between OH radicals seems to yield H_2 and O_2 . There is no evidence of a homogeneous reaction between OH radicals or that HO_2 exists other than as a collision complex of very short life.

J. W. S.

Metallic amides. II. Amides of the alkali metals. R. JUZA, K. FASOLD, and C. HAEBERLE. **III. Zinc and cadmium amides.** R. JUZA, K. FASOLD, and W. KUHN (Z. anorg. Chem., 1937, 234, 75—85; 86—96; cf. A., 1937, I, 256).— ρ , m.p., and heat of formation (q) have been determined for the amides of the respective metals, as follows: ρ : Li 1.18, Na 1.39, K 1.64, Rb 2.585, Cs 3.435; m.p.: Rb 309°, Cs 262°; Zn and Cd amides decompose at 200° and 120°, respectively. q : Li 56.3, Na 61.4, K 64.9, Rb 66.4, Cs 67.0, Zn 34.9, Cd 13.0 kg.-cal. per g.-mol.

F. J. G.

Crystallisation of potassium chloride from the fused state. Preparation of large monocrystals of sylvine. E. V. ZECHOVITZER (J. Phys. Chem. Russ., 1937, 9, 917—928).—KCl monocrystals with a diameter of 8—15 cm. were grown by the method of Kyropoulos, i.e., by drawing from the fused salt.

E. R.

Reaction limits in mixed crystals. G. TAMMANN (Z. anorg. Chem., 1937, 234, 33—41).—In previous papers (A., 1919, ii, 398; 1928, ii, 378) accounts were given of the reaction limits when alloys are submitted, during periods of a few months, to the action of corroding reagents. The action of these

reagents has now been continued for 15 to 20 years, without any serious change in the results.

F. J. G.

Combined action of heat and carbon on the alkaline-earth arsenates. H. GUÉRIN (Bull. Soc. chim., 1937, [v], 4, 1683—1696).—In presence of sugar C, conversion of meta- and pyro-arsenates into tribasic orthoarsenates is accelerated, and occurs at lower temp. than on pyrolysis. The orthoarsenates are reduced to arsenites at 700—800°, and at slightly higher temp. these give the alkaline-earth oxide, As, and CO. At 1450—1600° (800—850° for the Ba salt) some arsenide is formed, but cannot be obtained pure. The Ca and Sr salts give some carbide at 1500—1800°.

A. J. E. W.

Reducing action of amalgams. IV. K. MASUDA (J. Chem. Soc. Japan, 1935, 56, 1237—1250).—The reducing action of Zn amalgam increases with decreasing [Zn] (2.00—0.05%). CH. ABS. (c)

Complex compounds of mercury halides with the halides of the aliphatic amines. M. STRAUMANIS and A. CĪRULIS (Z. anorg. Chem., 1937, 234, 17—32).—A large no. of salts of types $\text{RNH}_2\text{X} \cdot \text{HgY}_2$, $2\text{RNH}_2\text{X} \cdot \text{HgY}_2$; $\text{RNH}_2\text{X} \cdot 2\text{HgY}_2$; $\text{C}_2\text{H}_4(\text{NH}_2)_2\text{X}_2 \cdot \text{HgY}_2$, and $2\text{C}_2\text{H}_4(\text{NH}_2)_2\text{X}_2 \cdot \text{HgY}_2$, where R = Me, Et and X, Y = Cl, Br, I, have been prepared. They are formulated as complex salts of anions $[\text{HgX}_3]'$, $[\text{HgX}_2\text{Y}]'$, $[\text{HgX}_4]''$, $[\text{HgX}_2\text{Y}_2]''$, $[\text{Hg}_2\text{X}_5]'$, $[\text{Hg}_2\text{X}_4\text{Y}]'$, and $[\text{HgX}_4\text{Y}_2]'''$. The same salt $(\text{RNH}_3)_2[\text{HgX}_2\text{Y}_2]$ is obtained from RNH_3X and HgY_2 as from RNH_3Y and HgX_2 . For details the original paper should be consulted.

F. J. G.

Aluminium fluorosulphate, and its conversion into fluorides. N. S. NIKOLAEV (J. Chem. Ind. Russ., 1937, 14, 1087—1097).— $\text{Al}_2\text{SO}_4\text{F}_4 \cdot 12\text{H}_2\text{O}$ (I) is obtained from CaF_2 and boiling aq. $\text{Al}_2(\text{SO}_4)_3$, or from ignited alunite, CaF_2 , and boiling 30% H_2SO_4 . Fe is removed from the filtrates by boiling with pyrolusite activated by N-NaOH or aq. BaS. (I) is converted into chiolite and/or cryolite by the action of Na_2SO_4 and HF, and into AlOF_4 by aq. NH_3 .

R. T.

Preparation of compounds of bivalent rare earths. L. HOLLECK and W. NODDACK (Angew. Chem., 1937, 50, 819—824).—Tervalent sulphates of Sm, Yb, Eu, Sc, Gd, Ge, Pr, and Nd may be reduced to small quantities of bivalent sulphates (XSO_4) by Sr amalgam of controlled reduction potential. The ppt. of SrSO_4 occludes the XSO_4 . The solutions of XSO_4 are colourless except for Yb (green) and the ppt. of SrSO_4 is colourless except for Sm (red). The wt. of X occluded on the SrSO_4 is parallel to the solubility of the sulphates $\text{X}_2(\text{SO}_4)_3$, except with Sc. The occluded XSO_4 is stabilised by the SrSO_4 , Eu giving the highest ratio of X^{II}/total X on the ppt., and Ce, Pr, and Nd the lowest. The XSO_4 on the SrSO_4 may be converted into XCO_3 by Na_2CO_3 solution, with corresponding colour change of the ppt.

R. S. B.

Malleable titanium and zirconium. W. KROLL (Z. anorg. Chem., 1937, 234, 42—50).—Apparatus for the reduction of large amounts of the oxides by Ca is described. The metals so obtained still contain

O which cannot be removed; they can be worked when warm but are more or less brittle in the cold.

F. J. G.

Lead thioaluminates. G. G. MONSELISE and G. SCACCABAROZZI (Gazzetta, 1937, 67, 511—513).—The thermal diagram of the system $\text{PbS}-\text{Al}_2\text{S}_3$ at temp. up to 1100° shows the existence of the two compounds $2\text{PbS} \cdot \text{Al}_2\text{S}_3$ and $\text{PbS} \cdot \text{Al}_2\text{S}_3$. O. J. W.

Thermal decomposition of lead formate and of formic acid at a lead surface. L. C. FREIDLIN and T. F. BULANOVA (Bull. Acad. Sci. U.R.S.S., Sér. Chim., 1937, 555—568).— $(\text{HCO}_2)_2\text{Pb}$ (I) decomposes at 240—280° chiefly according to $(\text{I}) \rightarrow \text{Pb} + 2\text{CO}_2 + \text{H}_2$. The side-reactions are: $\text{Pb} + \text{CO}_2 + \text{HCO}_2\text{H} \leftarrow (\text{I}) \rightarrow \text{PbO} + \text{CO}_2 + \text{CH}_3\text{O}$, and traces of HCO_2Me and MeOH are also formed. HCO_2H decomposes at 240—280° at a Pb surface exclusively according to the first reaction. It is concluded that (I) is an intermediate stage in the thermal decomp. of HCO_2H in Pb vessels. R. T.

New phosphates. G. HEDRICH (Chem.-Ztg., 1937, 61, 793—795).—The formation, properties, and applications of polymetaphosphates, polyorthophosphates, and thiophosphates are reviewed.

J. S. A.

Hexametaphosphoric acid. W. D. TREADWELL and F. LEUTWYLER (Helv. Chim. Acta, 1937, 20, 931—936).—The product obtained by heating NaH_2PO_4 or H_3PO_4 strongly still contains appreciable traces of PO_4''' , which may be detected from the amount of NaOH required to change the p_H from 4.3 to 9.5. The titration curve shows that the sixth dissociation const. of $\text{H}_6\text{P}_6\text{O}_{18}$ is about $10^{-1.8}$.

J. W. S.

Basic properties of orthophosphoric acid. E. J. ARLMAN (Rec. trav. chim., 1937, 56, 919—922).—When dry H_3PO_4 is mixed with excess of dry HClO_4 and the mixture cooled in ice and NaCl the compound $\text{H}_3\text{PO}_4 \cdot \text{HClO}_4$, m.p. 46—47°, separates. Electrolysis of a solution in MeNO_2 causes migration of H_3PO_4 towards the cathode, so it is suggested that the compound should be formulated $\text{P}(\text{OH})_4 \cdot \text{ClO}_4$.

J. W. S.

Hydrogen compounds of arsenic. I. Preparation of arsine in liquid ammonia. Physical properties of arsine. II. Sodium and potassium dihydrogen arsenides. W. C. JOHNSON and A. PECHUKAS (J. Amer. Chem. Soc., 1937, 59, 2065—2068, 2068—2071).—I. AsH_3 can be prepared in good yield by the action of NH_4Br on Na arsenides (Na_3As_x) in liquid NH_3 . No other As-containing gas or solid hydride is formed. The v.p. of solid and liquid AsH_3 has been measured at -138° to -63° and d for liquid AsH_3 at -111.8° to -64.3° . The b.p. (760 mm.) is -62.4° , the m.p. -116.3° , and the latent heats of vaporisation and fusion 4165 and 675 g.-cal. per mol., respectively. Liquid AsH_3 is only slightly sol. in liquid NH_3 .

II. Action of Na, K, or KNH_2 on AsH_3 in liquid NH_3 yields Na and K H, arsenides (MAsh_2), which regenerate AsH_3 on the action of NH_4Br in liquid NH_3 . KAsH_2 reacts with MeCl in liquid NH_3 to yield AsMeH_2 , m.p. -143° . The v.p. of AsMeH_2 has been determined at -74° to 3.0° , and indicates that

the b.p. is 2.0° and the heat of vaporisation 5390 g.-cal. per mol. KAsH_2 decomposes at $>115^\circ$ yielding H_2 and K_3As_2 . J. W. S.

Thermal decomposition of tervalent vanadium sulphate. F. RIVENQ (Bull. Soc. chim., 1937, [v], 4, 1697—1702).—The reactions occurring on heating in a vac. are: (above 410°) $2\text{V}_2\text{O}_3(\text{SO}_3)_3 \rightarrow \text{V}_2\text{O}_4(\text{SO}_3)_2 + \text{V}_2\text{O}_4 + \text{SO}_2 + \text{SO}_3$; $\text{V}_2\text{O}_4(\text{SO}_3)_2 \rightarrow \text{V}_2\text{O}_5 + \text{SO}_2 + \text{SO}_3$; (below 410°) $\text{V}_2\text{O}_3(\text{SO}_3)_3 \rightarrow \text{V}_2\text{O}_4(\text{SO}_3)_2 + \text{SO}_2$; $2\text{V}_2\text{O}_4(\text{SO}_3)_2 \rightarrow \text{V}_2\text{O}_5(\text{SO}_3)_2 + \text{V}_2\text{O}_4 + \text{SO}_2 + \text{SO}_3$; $\text{V}_2\text{O}_5(\text{SO}_3)_2 + \text{V}_2\text{O}_4 \rightarrow 2\text{V}_2\text{O}_5 + \text{SO}_2 + \text{SO}_3$. A. J. E. W.

Sulphur iodide. M. R. A. N. RAO (Current Sci., 1937, 6, 63).—A yellow solution of *S iodide* is formed on treatment of a dil. CCl_4 solution of S_2Cl_2 with KI. The solution has a characteristic absorption band in the visible spectrum. It decomposes at room temp., giving S and I, but is stable at low temp. The reaction in CCl_4 with aq. NaOH is analogous to that of a similar S_2Cl_2 solution. A. J. E. W.

Oxidation of chromic oxide by silver oxide. R. LYDÉN (Z. anorg. Chem., 1937, 234, 59—62).—In presence of H_2O , Cr_2O_3 and Ag_2O react forming Ag_2CrO_4 and Ag. The reaction proceeds moderately rapidly at 100° and with an appreciable velocity at room temp. F. J. G.

Tungsten bronzes. A. GLAZUNOV and V. JOLKIN (Chem. Listy, 1937, 31, 358—363).—W bronzes are probably solid solutions of two or more tungstates in each other. The bronzes react with Na, Li, or K liberated at the cathode, to yield M_2WO_4 , $\text{M}_2\text{W}_2\text{O}_7$, and W. R. T.

Fluorine at low temperatures. I. Preparation, analysis, and handling of fluorine. S. AOYAMA and E. KANDA (Bull. Chem. Soc. Japan, 1937, 12, 409—416).—Technical details of the prep. of F_2 by electrolysis of fused $\text{KF}\cdot\text{HF}$, and of the storage of F_2 , are given. The reactions between C, P, S, Se, and F_2 are facilitated if the F_2 flows past the solids; in some cases no reaction takes place in a still atm. of F_2 . F. J. L.

Amorphous and crystalline hydrated oxides and oxides. XXXIV. Hypotonic external solution as cause of ageing of radiographically amorphous ferric hydroxide. A. KRAUSE and K. DOBRZYŃSKA (Kolloid-Z., 1937, 81, 45—48; cf. A., 1937, I, 196).—Amorphous $\text{Fe}(\text{OH})_3$ ages rapidly when preserved under H_2O or N-NaOH , but slowly or not at all when the concn. of NaOH or salts in the external liquid is $>4-5\text{N}$. An explanation is offered. F. L. U.

Active substances. XXI. Preparation of goethite ($\alpha\text{-FeO}\cdot\text{OH}$). R. FRICKE and O. GLEMSE (Ber., 1937, 70, [B], 2117—2119).—Freshly prepared Fe^{III} oxide hydrate is allowed to remain in contact with 2N-KOH at room temp. for 3—4 hr. after which steam is passed through the mixture for 2 hr. KOH is then "neutralised" with rather more than the calc. amount of NH_4Cl and the ppt. is washed until the washings are free from Cl^- , whereby a very pure goethite A is obtained. Goethite B is prepared by oxidising FeSO_4 with H_2O_2 at 50° ; after

being washed until the wash H_2O is free from SO_4^{2-} the ppt. is treated with superheated steam at 170° .

H. W.

Reversible oxidation of chlorophyll. E. RABINOWITCH and J. WEISS (Proc. Roy. Soc., 1937, A, 162, 251—267).—Chlorophyll reacts with Fe^{III} salts forming a yellow product from which it can be regained by the action of Fe^{II} salts. The reaction is studied by means of absorption measurements, in the range λ 3500 to 7000 \AA , of MeOH solutions of (i) pure chlorophylls *a* and *b* and the "natural" mixture of the two ethylchlorophyllides, (ii) the three substances after reaction with FeCl_3 , and (iii) the same solutions "restored" by FeCl_2 . The characteristic red absorption band is suppressed by the reaction with FeCl_3 and restored by addition of FeCl_2 . The nature of the reaction is discussed. Chlorophyll decolorised by FeCl_3 is restored by keeping in a dark room for several hr. This is attributed to the removal of FeCl_3 , which oxidises the solvent MeOH in the presence of chlorophyll. Analogous results are obtained with Co^{IV} salts, I, and CuCl_2 . G. D. P.

Substituted cyano-cobaltates. IV. Aquo-pentacyano-cobaltic acid and its salts. P. R. RAY and N. K. DUTT (Z. anorg. Chem., 1937, 234, 65—74).—When $\text{K}_4[\text{Co}(\text{S}_2\text{O}_3)(\text{CN})_5]$ is oxidised by H_2O_2 in a solution buffered with NaOAc , and the solution treated with AgNO_3 , *Aq aquo-pentacyanocobaltate*, $\text{Ag}_2[\text{Co}(\text{H}_2\text{O})(\text{CN})_5]\cdot 5\text{H}_2\text{O}$ (I), is pptd. By appropriate double decomp. the following salts can be obtained: $\text{M}^I_2[\text{Co}(\text{H}_2\text{O})(\text{CN})_5]$, ($\text{M}^I = \text{K}, \text{Na}, \text{Li}, \text{NH}_4$); $\text{M}^{II}[\text{Co}(\text{H}_2\text{O})(\text{CN})_5]\cdot 5\text{H}_2\text{O}$, ($\text{M}^{II} = \text{Cd}, \text{Ca}, \text{Sr}$); $\text{Ba}[\text{Co}(\text{H}_2\text{O})(\text{CN})_5]\cdot 3\text{H}_2\text{O}$; $\text{PbO}\cdot\text{Pb}[\text{Co}(\text{H}_2\text{O})(\text{CN})_5]\cdot 5\text{H}_2\text{O}$. The free acid $\text{H}_2[\text{Co}(\text{H}_2\text{O})(\text{CN})_5]$ is comparable with H_2SO_4 in strength. When (I) is dehydrated in vac. over H_2SO_4 a salt $\text{Ag}_2[\text{Co}(\text{CN})_5]$ is obtained which is only feebly paramagnetic and is therefore a true complex salt having the co-ordination no. = 5. F. J. G.

Cobaltinitrites of hexamethylenetetramine.—See A., II, xvii e.

Nitro-pyridino-compounds of rhodium. V. V. LEBEDINSKI and S. F. SILIN (Ann. Sect. Platine, 1937, 14, 33—39).— $\text{Na}_3\text{Rh}(\text{NO}_2)_6$ and $\text{C}_5\text{H}_5\text{N}$ afford the salt $[\text{Rh}(\text{C}_5\text{H}_5\text{N})_3(\text{NO}_2)_3]$, the filtrate from which gives $\text{NH}_4[\text{Rh}(\text{C}_5\text{H}_5\text{N})_3(\text{NO}_2)_3]\cdot 1.5\text{H}_2\text{O}$ (I) when treated with conc. aq. NH_4Cl . The corresponding $[\text{Pt}(\text{NH}_3)_4]$ and guanidine salts of (I) are described.

R. T.

Oxidation of iridium sulphide by nitric acid. N. K. PSCHENITZIN and S. E. KRASIKOV (Ann. Sect. Platine, 1937, 14, 19—32).— $\text{Ir}(\text{SH})_3$ is converted by hot conc. HNO_3 into the acid $\text{H}_2\text{Ir}_4(\text{SO}_3)_7[(\text{NH}_3\text{Et})_2, (\text{NH}_3\text{Me})_2, \text{Ba}, \text{Ag}, \text{and Hg, salts}]$.

R. T.

Oxidation of hydroxylamine compounds of platinum. V. I. GOREMIKIN (Ann. Sect. Platine, 1937, 14, 41—75).—Hydroxylaminoplatinum compounds react with Cl_2 to yield HxCl_2 compounds ($\text{Hx} = \text{NH}_2\text{OH}$), from which Hx is then eliminated, leaving Cl^- in its place. Thus $[\text{PtHx}_4](\text{OH})_2$ in neutral aq. solution yields successively $[\text{PtHx}_4]\text{Cl}_2$, $[\text{PtHx}_3\text{HxCl}_2]\text{Cl}_2$, $[\text{PtHx}_2\text{HxCl}_2]\text{Cl}_2$, $[\text{PtCl}_4]^{2-}$, and $[\text{PtCl}_6]^{2-}$; an intermediate product is $[\text{PtHx}_4][\text{PtCl}_4]$.

which reacts with Cl_2 to give H_2PtCl_6 and N_2 . The following analogous reactions are described: *cis*- $[\text{PtHx}_2(\text{NH}_3)_2]\text{Cl}_2 + 2\text{Cl}_2 \rightarrow (\text{NH}_4)_2\text{PtCl}_6 + 2\text{H}_2\text{O} + \text{N}_2$; *trans*- $[\text{PtHx}_2(\text{NH}_3)_2]\text{Cl}_2 \rightarrow [\text{Pt}(\text{NH}_3)_2\text{Cl}_2] \rightarrow [\text{Pt}(\text{NH}_3)_2\text{Cl}_4]$; *trans*- $[\text{PtHx}, \text{NH}_3, \text{Cl}] \text{ (I)} \rightarrow [\text{Pt}, \text{HxCl}_2, \text{NH}_3, \text{Cl}_2] \text{ (NH}_4)_2\text{PtCl}_6 \rightarrow (\text{NH}_4)_2\text{PtCl}_6$; $[\text{Pt}, \text{NH}_3, \text{C}_5\text{H}_5\text{N}, \text{Cl}_4][\text{Pt}, \text{Hx}, \text{NH}_3, \text{C}_5\text{H}_5\text{N}, \text{Cl}]\text{Cl} \rightarrow [\text{Pt}, \text{HxCl}_2, \text{NH}_3, \text{C}_5\text{H}_5\text{N}, \text{Cl}]\text{Cl} \rightarrow [\text{Pt}, \text{C}_5\text{H}_5\text{N}, \text{Cl}_5]\text{NH}_4$; *trans*- $[\text{Pt}, \text{Hx}, \text{NH}_3, (\text{C}_5\text{H}_5\text{N})_2]\text{Cl}_2$ [prepared from (I) and $\text{C}_5\text{H}_5\text{N}$] $\rightarrow [\text{Pt}(\text{C}_5\text{H}_5\text{N})_2\text{Cl}_4]$; *trans*- $[\text{Pt}, \text{Hx}, \text{C}_5\text{H}_5\text{N}, \text{NO}_2, \text{NH}_3]_2[\text{PtCl}_4] \rightarrow [\text{Pt}, \text{NH}_3, \text{C}_5\text{H}_5\text{N}, \text{Cl}_2] \rightarrow [\text{Pt}, \text{NH}_3, \text{C}_5\text{H}_5\text{N}, \text{Cl}_4]$.

R. T.

Ethylene compounds of platinum. I. I. TSCHERNIAEV and A. D. GELMAN (Ann. Sect. Platine, 1937, 14, 77—121).— K_2PtX_4 (I) in 3—5% HCl and C_2H_4 react at room temp. as follows ($\text{X} = \text{Cl}, \text{Br}$): (I) + $\text{C}_2\text{H}_4 \rightarrow \text{K}[\text{Pt}, \text{C}_2\text{H}_4, \text{X}_3]$ (II) + KCl . (II) reacts with $[\text{PtM}_4\text{X}_2]$ to give $[\text{PtM}_4][\text{Pt}, \text{C}_2\text{H}_4, \text{X}_3]$ ($\text{M} = \text{NH}_3, \text{C}_5\text{H}_5\text{N}$), and with M to afford the compounds $[\text{Pt}, \text{C}_2\text{H}_4, \text{M}, \text{X}_3]$. The equilibrium $[\text{Pt}, \text{C}_2\text{H}_4, \text{M}, \text{X}_3] \rightleftharpoons$

$\text{MH}[\text{Pt}, \text{C}_2\text{H}_4, \text{X}_3]$ is shown to exist, and the products are isolated and described. The C_2H_4 complexes behave analogously to other Pt complexes; they are stable in dry air, and in light, but are instantly decomposed by neutral or alkaline aq. solutions, with production of Pt. The stability of the complexes rises in the series $\text{M} = \text{CS}(\text{NH}_2)_2 < \text{NH}_3 < \text{C}_5\text{H}_5\text{N} < \text{quinoline}$, and $\text{X} = \text{CN} < \text{CNS} < \text{NO}_2 < \text{I} < \text{Br} < \text{Cl}$. Attempts to determine the configuration of the complexes were unsuccessful, owing to their instability.

R. T.

Ring fission in complex platinum compounds. I. I. TSCHERNIAEV and A. N. FEDOROVA (Ann. Sect. Platine, 1937, 14, 9—18).— $[\text{Pt}, \text{en}, \text{NH}_3, \text{Cl}]\text{Cl}$ (I) and $\text{N}_2\text{H}_4, 2\text{HCl}$ (II) or HCl in hot aq. solution yield a mixture of $\text{Pt}, \text{en}, \text{Cl}_2$, $\text{Pt}, \text{en}, \text{NH}_3, \text{Cl}_2, \text{HCl}$ (III), and $(\text{Pt}, \text{NH}_3, \text{Cl}_2), \text{en}$. (III) reacts with Cl_2 to give $\text{Pt}, \text{en}, \text{NH}_3, \text{Cl}_4, \text{HCl}$ (IV), which regenerates (III) when heated with (II). (IV) undergoes partial hydrolysis when recryst. from H_2O , to yield $([\text{Pt}, \text{NH}_3, \text{Cl}_3, \text{H}_2\text{O}]\text{Cl})_2, \text{en}$. (IV) and aq. NH_3 afford $[\text{Pt}, \text{en}(\text{NH}_3)_2\text{Cl}_2]\text{Cl}_2$, converted by (II) into (I).

R. T.

Chromatography as a new aid to analytical chemistry. G. M. SCHWAB (Z. Elektrochem., 1937, 43, 791).—See A., 1937, I, 529, 578.

J. W. S.

Angular constants of microcrystalline profiles and silhouettes in the conclusive identification of substances. A. C. SHEARD (Ind. Eng. Chem. [Anal.], 1937, 9, 496—502).—Attention is directed to the importance of measuring the profile angles of crystals, which are shown to be const., as a ready means of identification, especially in micro-crystals where the measurement of interfacial angles is difficult. The profile angular consts. of several microcryst. org. and inorg. substances have been determined.

E. S. H.

Quantitative emission spectral analysis of aqueous solutions. F. ROHNER (Helv. Chim. Acta, 1937, 20, 1054—1059).—The test solution is imbibed on discs produced from cotton-wool soaked in

30% gelatin and allowed to set. The emission spectrum of the sample is compared with a standard by the method of homologous linear pairs, using the Gerlach luminous arc with plate electrodes. It is claimed that this method introduces less uncertainty through presence of impurity than the usual method of imbibing the solution on a C rod. The elements are also completely uniformly distributed in the test disc.

J. W. S.

Determination of heavy hydrogen in H_2 - D_2 mixtures by heat conductivity. R. C. BURSTEIN (J. Phys. Chem. Russ., 1937, 9, 870—874).—A discussion of Farkas' method of analysing H_2 - D_2 mixtures.

E. R.

Determination of deuterium oxide-water mixtures. W. H. PATTERSON (J.C.S., 1937, 1745—1746).—The temp. of mutual miscibility of PhOH - H_2O - D_2O mixtures have been determined. In replacing H_2O by an equimol. H_2O - D_2O mixture the temp. rise is 6.2° . On the basis that a rise of 1.24° represents 0.1 mol. fraction of D_2O an approx. analysis can be made.

E. S. H.

Potentiometric titration of acids in mixtures of *n*-butyl alcohol and water. R. N. EVANS and J. E. DAVENPORT (J. Amer. Chem. Soc., 1937, 59, 1920—1922).—Curves have been obtained for the titration of equiv. amounts of picric acid and BzOH in several H_2O - Bu°OH mixtures. With increasing $[\text{H}_2\text{O}]$ the stronger acid end-point becomes less distinct and the weaker acid end-point more distinct. The measurements have application in problems where it is necessary to distinguish acids of different strengths in low concn.

J. W. S.

Reaction of bromophenol-blue, iodophenol-blue, and chlorophenol-blue with hydroxyl ion. F. W. PANEPINTO and M. KILPATRICK (J. Amer. Chem. Soc., 1937, 59, 1871—1876).—The fading of the colour of these compounds in presence of OH^- follows a unimol. law, the rate-determining step being the reaction between the bivalent sulphonephthalein anion and OH^- . The effect of temp., but not that of ionic strength, is in accord with theory.

J. W. S.

Volumetric determination of small amounts of water by means of cinnamoyl chloride. C. J. VAN NIEUWENBURG (Mikrochim. Acta, 1937, 1, 71—74).—The material is heated in a current of dry air, and H_2O is absorbed in $\text{CHPh}\cdot\text{CH}\cdot\text{COCl}$, m.p. 36° (prep. described), maintained at 65° . The HCl evolved is absorbed in H_2O , and titrated with 0.02N-borax.

J. S. A.

Micro-determination of iodine by catalytic method. E. B. SANDELL and I. M. KOLTHOFF (Mikrochim. Acta, 1937, 1, 9—25).—The very slow oxidation of $\text{AsO}_3^{'''}$ by $\text{Ce}(\text{SO}_4)_2$ is catalysed by traces of I^- ; the catalytic effects of Cl^- and Br^- on the reaction are 10^{-7} to 10^{-6} as great as that of I^- . CN^- inhibits the catalysis, as do Ag and Hg , which do not affect the catalytic action of Os on the same reaction. F^- also interferes, but interference may be suppressed by adding AlCl_3 . The catalytic action $\propto [\text{I}^-]$ down to $[\text{I}^-] = 10^{-8}$ in the presence of small amounts of Cl^- . 0.00005—0.001 mg. of I may be

determined by measuring the time required for the reduction of a measured vol. of 0.1N-Ce(SO₄)₂ by an excess of 0.1N-Na₃AsO₃ containing the sample for analysis, using [Fe o-phenanthroline]³⁺ as indicator. The catalytic effect of other materials is eliminated by measurement of the rate of reaction after the addition of a measured amount of I'. 1 part of I may be so determined in the presence of 10⁶ parts of Cl or Br.

J. S. A.

Volumetric determination of iodine using the Elek-Hill micro-bomb. A. ELEK and R. A. HARTE (Ind. Eng. Chem. [Anal.], 1937, 9, 502).—After fusion in the micro-bomb, I is present as IO₃' and is determined by adding KI and titrating with Na₂S₂O₃. The error is <0.2%.

E. S. H.

Volumetric determination of fluorine. J. N. FRERS and H. LAUCKNER (Z. anal. Chem., 1937, 110, 251—262).—The material is distilled with SiO₂ (ignited previously at 1100°) and HClO₄. The distillate is neutralised (bromophenol-blue), and an equal vol. of EtOH is added. It is then titrated with Th(NO₃)₄ + Zr(NO₃)₄, using a standardised amount of saturated alcoholic quinalizarin + Na alizarin-sulphonate as indicator (cf. A., 1933, 242).

J. S. A.

Uranometric determination of fluoride. R. FLATT (Helv. Chim. Acta, 1937, 20, 894—904).—The formation of double fluorides of the type MUF₅ by the action of alkali fluorides on U^{IV} salts is applied to the potentiometric titration of F'. The solution is titrated with 0.05N-U(SO₄)₂ (0.2N in H₂SO₄) in the presence of a buffer of K sulphanilate and sulphanilic acid. The determination is unaffected by Na⁺, K⁺, NH₄⁺, Fe²⁺, Zn²⁺, and Cd²⁺, but the presence of Al³⁺, Ca²⁺, Fe³⁺, or PO₄³⁻ ions must be avoided. Details are given of the application of the method to the determination of F' in silicofluorides.

J. W. S.

Analysis of very dilute ozone. III. Sensitising action of the per-acid present in the aldehyde. Ozone content of the air at different altitudes. E. BRINER and E. PERROTTET (Helv. Chim. Acta, 1937, 20, 1200—1207; cf. A., 1937, I, 260, 324).—The presence of per-acid in the aldehyde increases the sensitivity of the authors' method of determining atm. O₃. The absorbing agent recommended is 5 c.c. of PrCHO in 20 c.c. of petrol and a per-acid content corresponding with 2 c.c. of 0.1N-Na₂S₂O₃. After the reaction, analysis is carried out rapidly away from bright light, in order to avoid autoxidation. Tests of air from various localities and altitudes indicates an [O₃] varying between 0.7 and 3.8 × 10⁻⁶%.

J. W. S.

Determination of oxygen and nitrogen in steel.—See B., 1937, 1214.

Direct determination of oxygen in coal and other solid fuels.—See B., 1937, 1151.

Indirect titration of sulphate with barium chloride using sodium rhodizonate as indicator in solution. L. VON ZOMBORY (Z. anal. Chem., 1937, 110, 278—279).—A claim for priority over Mutschin and Pollak (cf. A., 1936, 950; 1937, I, 148, 324).

J. S. A.

Simultaneous determination of ammonia and hydrogen sulphide in dark and coloured liquids.

I. TARANENKO (Koks i Chim., 1934, No. 3, 65—66).—The 100-c.c. sample was heated for 30—60 min. at 100—150° in a 250-c.c. Kjeldahl flask, and the resulting gases led through a trap and Schiff condenser into three flasks containing (1) standardised H₂SO₄, (2) I, and (3) Na₂S₂O₃.

CH. ABS. (e)

Volumetric micro-determination of nitrates. L. SZEBELLÉDY and M. AJTAI (Mikrochim. Acta, 1937, 1, 255—259).—Disadvantages of the method previously described (cf. A., 1928, 498, 979) have been investigated. Greater accuracy (0.4%) is claimed if dilution of the strongly acid solution is avoided by titrating with N-FeSO₄ delivered from a micro-burette instead of with 0.1N-FeSO₄.

C. R. H.

Determination of orpiment in shellac.—See B., 1937, 1237.

Rapid determination of silicon in cast iron, steel, and silicates.—See B., 1937, 1212.

Spectrographic determination of carbon, silicon, manganese, nickel, chromium, and molybdenum in iron and steel.—See B., 1937, 1212.

Selective analysis of carbon monoxide, hydrogen, and methane.—See B., 1937, 1154.

Microchemical testing of materials [for alkali].—See B., 1937, 1141.

Analysis of alkali metals. T. KATO (J. Electrochem. Assoc. Japan, 1935, 3, 276—283; cf. A., 1936, 578).—The alkali perchlorates are treated with MeOAc and filtered, the residue consisting of the K, Rb, and Cs salts, which are separated by differences in the solubilities of the H tartrates and phosphotungstates. Li and Na are separated by the difference in solubility of their chlorides in aq. NH₃.

CH. ABS. (e)

Internal electrolysis. III. Determination of small quantities of silver in presence of various other metals and its application to the analysis of galena and pyrites. J. G. FIFE (Analyst, 1937, 62, 723—727; cf. A., 1936, 1479).—Using the apparatus described previously (*loc. cit.*), with anodes of 18 S.W.G. Cu wire, an anolyte of Cu(NO₃)₂ = 1 g. of Cu and 0.1 ml. of conc. HNO₃ per 100 ml. and a catholyte, of approx. 300 ml., containing the Ag to be determined (added as AgNO₃), Pb(NO₃)₂ = 10 g. of Pb, 8 ml. of conc. HNO₃, and varying amounts of Cu(NO₃)₂ and Bi(NO₃)₃, electrolysis is carried out for 30 min. at 60°. The max. amount of Ag that can be thus determined is 8.5 mg. In aq. NH₃ in presence of Cu, the Cu in the catholyte must be present as Cu^I, that in the anolyte as Cu^{II}. The anolyte contains 0.1 g. of Cu as Cu(NO₃)₂, 2 g. of NH₄NO₃, and 3 ml. of aq. NH₃ (d 0.880) per 100 ml., the catholyte (300 ml. approx.) the Ag to be determined, 7 g. of Na₂SO₃, 9 ml. of aq. NH₃ (d 0.880), and varying amounts of Cu, and is heated before electrolysis (which is carried out at 70°) until decolorised. The methods are applied to the determination of Ag in galena and cupreous Fe pyrites.

E. C. S.

Spectrographic chemical analysis. III. Quantitative spectrographic analysis of salt

solutions. Y. UZUMASA and H. OKUNO (J. Chem. Soc. Japan, 1935, 56, 1174—1179; cf. A., 1934, 857).—Data connecting spectrographic measurements with the consens. of Ag, Al, Ba, Ca, Cr, Co, Fe, Mn, Mg, Ni, Sr, and Zn in solution, are recorded. CH. ABS. (e)

Determination of silver in photographic fixing baths.—See B., 1937, 1275.

Chemistry of beryllium with special reference to analysis of beryl. L. F. KERLEY (J. Proc. Austral. Chem. Inst., 1937, 4, 223—232).—The quant. analytical separation of Be from beryl is reviewed. Final separation from Fe and Al is best effected by means of NaHCO_3 or 8-hydroxyquinoline + NH_4OAc . In either case, Be is subsequently pptd. by exact neutralisation with aq. NH_3 . J. S. A.

Detection of zinc in the presence of iron. G. ERÉNYI (Tech. Kurir, 1937, 8, 79).—On addition of alkali fluorides to a solution of Zn^{++} and Fe^{+++} in aq. HCl , $[\text{FeF}_6]^{3-}$ is formed; this in contrast to Zn^{++} gives no ppt. with $\text{K}_4\text{Fe}(\text{CN})_6$. When using $\text{K}_3\text{Fe}(\text{CN})_6$, the Zn ppt. is brownish-yellow. The sensitivity of the reaction is 1 in 5×10^5 . E. P.

Colorimetry with colloidal solutions. II. Colorimetric determination of cadmium as sulphide. R. JUZA and R. LANGHEIM (Z. anal. Chem., 1937, 110, 262—270).—In presence of Cd alone, the solution is made alkaline with NH_3 , and $\text{KCN} + (\text{NH}_4)_2\text{SO}_4 + 1\%$ aq. gelatin are added. The solution is added to a saturated aq. solution of H_2S , and colorimetric after 15 min. 1000 parts of Zn do not interfere in the presence of sufficient KCN. In presence of Cu, Co, or Ni, KCN is added until the solution is colourless, or a min. of colour is reached; an additional quantity is added for reaction with the Cd, and the CdS suspension is prepared as above. 100 parts of Ni, or 10 parts of Cu or Co, do not interfere. J. S. A.

Determination of small amounts of cadmium with "dithizone." H. FISCHER and G. LEOPOLDI (Mikrochim. Acta, 1937, 1, 30—42).—0.001—0.04 mg. of Cd may be determined colorimetrically by extracting the solution, mixed with 10% aq. NaOH , with a solution of dithizone (I) in CCl_4 . The CCl_4 solution of the Cd-(I) compound is washed with N-HCl , and the resulting green CCl_4 solution of (I) is colorimetric. Alternatively, the Cd-(I) compound may be decomposed with 1% HNO_3 , and (I) determined by indirect titration with AgNO_3 (cf. A., 1937, I, 97). 0.002% of Cd may be determined in Zn by preliminary enrichment by pptn. of CdS + some ZnS + other heavy metals with Na_2S . The ppt. is dissolved in HNO_3 ; Cu and Ag are removed by treating the acid solution with (I), and Cd is determined as above. Cd in Sn may be determined by removal of Sn as SnBr_4 . Cu, Ag, Au, Pd, Ni, and Co interfere with the direct determination of Cd. In presence of Ag or Hg, Cd is separated by adding an excess of $\text{NH}_4\text{CNS} + \text{C}_5\text{H}_5\text{N}$ and extracting with CHCl_3 . The extract is evaporated down with HNO_3 , and Cd is determined as above. If much Cu is present, this must first be reduced to Cu^I . J. S. A.

Analytical separation of lead from Mg^{++} , Ca^{++} , Sr^{++} , Ba^{++} , and Tl^+ by means of carbon dioxide in

pyridine solution. A. JÍLEK and O. LAUBOVA-SKLENAROVA (Chem. Listy, 1937, 31, 335—339).—Quant. separation of Pb^{++} from its mixtures with Mg^{++} and Tl^+ (>0.2 g. of Pb^{++} , Mg^{++} , and Tl^+ per 100 g. of $\text{C}_5\text{H}_5\text{N}$ solution) is achieved by saturation with CO_2 . In presence of Ca^{++} , the ppt. of PbCO_3 is contaminated with CaCO_3 , necessitating redissolution and repptn. The method is not applicable, even with double pptn., to determination of Pb in presence of Ba and Sr. R. T.

Determination of lead in biological materials.—See A., III, 504.

Determination of lead in tin-plating metal.—See B., 1937, 1221.

Micro-determination of thallium by potentiometric titration using "thionalide." B. BERG and E. S. FAHRENKAMP (Mikrochim. Acta, 1937, 1, 64—70).—Tl is pptd. with thionalide (cf. A., 1937, I, 476), and the ppt. is dissolved in AcOH . Org. compounds are destroyed with H_2SO_4 and H_2O_2 , and the residue is dissolved in HCl . Tl is finally determined by potentiometric titration with 0.002—0.0002N- KBrO_3 . Alternatively, the Tl ppt. may be dissolved in AcOH or $\text{H}_2\text{SO}_4 + \text{EtOH}$, and titrated directly at 50° with 0.002N-I, whereby dithionalide is formed. J. S. A.

Colorimetry with colloidal solutions. III. Colorimetric determination of copper as ferrocyanide. H. HAHN, R. JUZA, and R. LANGHEIM (Z. anal. Chem., 1937, 110, 270—275).— $\text{AcOH} + \text{NH}_4\text{OAc} + 1\%$ aq. gelatin are added to the solution, and then $\text{K}_4\text{Fe}(\text{CN})_6$. The brown coloration is colorimetric within 1 hr., or photometric using blue-green light. In the presence of Pb, sufficient NH_4OAc must be added. J. S. A.

Titration of copper with alkali cyanide solutions. ANON. (Ind. Chem., 1937, 13, 405—406).—The solution of Cu is treated with a slight excess of aq. NH_3 , and titrated with KCN until just colourless, corresponding with the formation of $\text{K}_3\text{NH}_4[\text{Cu}(\text{CN})_3]_2 + \text{NH}_4\text{CNO}$. Alkaline plating baths are first boiled with $\text{KClO}_3 + \text{HCl}$, and then made alkaline with NH_3 before titration. J. S. A.

Aniline thiocyanate; a sensitive reagent for copper. F. P. DWYER and R. K. MURPHY (J. Proc. Austral. Chem. Inst., 1937, 4, 331—342).—The reagent (prepared by mixing 1 c.c. of 50% aq. NH_4CNS with 1 c.c. of NH_2Ph , adding 2N- HCl until the emulsion clears, diluting to 5 c.c., and clearing with drops of EtOH) yields a yellowish-brown ppt. of $\text{Cu}(\text{CNS})_2 \cdot 2\text{NH}_2\text{Ph}$ (fine needles) when added to a solution containing Cu^{++} . The method enables detection of 0.5×10^{-6} g. of Cu in 1 c.c. of solution. The reagent also yields ppts. with Pb^{++} , Hg^{++} , Bi^{+++} , Cr^{+++} , Al^{+++} , Ag^+ , Cd^{++} , Zn^{++} , Co^{++} , Ni^{++} , and Mn^{++} , but the first five can be removed by previous treatment with NH_3 , and Ag^+ by NaCl . Of the remainder only Cd^{++} and Ni^{++} yield ppts. in 1% solution, and if a min. quantity of reagent is used the colour of the Cu compound can be detected. On keeping the reagent decomposes with separation of $\text{NHPh} \cdot \text{CS} \cdot \text{NH}_2$. J. W. S.

Detection and determination of copper by colour reactions. P. THOMAS (Biochem. Z., 1937, 293, 396—398).—The rose colour reaction of Cu salts with phenolphthalein is more sensitive than that with urobilin in detecting traces ($<10^{-6}$ g.) of Cu.

P. W. C.

Diphenylthiocarbazone (dithizone) as an analytical reagent. H. A. LIEBHAFSKY and E. H. WINSLOW (J. Amer. Chem. Soc., 1937, 59, 1966—1971).—The visible spectral transmissions of CCl_4 solutions of dithizone (I), its oxidation product, and Cu and Pb dithizonates have been measured and are applied to the determination of traces of Pb and Cu. 10^{-6} g. of either metal can be determined with fair accuracy, but difficulties are encountered in obtaining complete extraction of the metal by the CCl_4 solution and in preventing oxidation of the reagent, which seems to be catalysed by Cu^{++} . Optimum conditions for the determinations are detailed. The compounds appear to contain 1 atom of Cu to 2 mols. of (I) and 1 atom of Pb to 1 mol. of (I), respectively. Possible structures of these compounds are discussed.

J. W. S.

Determination of copper, zinc, and lead in silicate rocks. E. B. SANDELL (Ind. Eng. Chem. [Anal.], 1937, 9, 464—469).—The sample is decomposed with HF-HClO_4 and Na_2CO_3 , and Cu, Zn, and Pb are extracted as dithizonates with a solution of dithizone in CCl_4 . The separated CCl_4 layer is shaken with 0.01N-HCl, yielding ZnCl_2 and PbCl_2 in the aq. phase. The CCl_4 layer is evaporated to dryness and the residue ignited to CuO , which is dissolved in HCl and determined colorimetrically with dithizone. Zn and Pb are determined in separate aliquot portions of the aq. solution by colorimetric methods using dithizone.

E. S. H.

Determination of copper in cast iron and steel.—See B., 1937, 1212.

Polarographic determination of copper, nickel, and cobalt in presence of one another in steels.—See B., 1937, 1216.

Photometric determination of copper in metals—See B., 1937, 1215.

Volumetric determination of mercury [in organic compounds].—See A., II, 476.

Use of standard sodium hydroxide solution for the standardisation of potassium permanganate [via oxalic acid]. D. L. SCOLES and J. ROTHSTEIN (J. Chem. Educ., 1937, 14, 326—327).—An examination of the suitability and accuracy of the method. Data obtained for the N of ten solutions of KMnO_4 each of which was standardised against a standard, CO_3^{--} -free NaOH solution by using each one of six different samples of $\text{H}_2\text{C}_2\text{O}_4$ as a "bridge," are tabulated and discussed. The method is regarded as satisfactory.

L. S. T.

Intensity and stability of ferric thiocyanate colour developed in β -methoxyethyl alcohol. H. W. WINSOR (Ind. Eng. Chem. [Anal.], 1937, 9, 453—455).—The colour is more intense and more stable in $\text{OMe}[\text{CH}_2]_2\text{OH}$ (I) than in other solvents or solvent mixtures. Other advantages of (I) as a medium are discussed, and its use is recommended in

the determination of small amounts of Fe in biological materials.

E. S. H.

Dipotassium sodium cobaltinitrite and its application to the gravimetric determination of cobalt. C. F. CUMBERS and J. B. COPPOCK (J.S.C.I., 1937, 56, 405—407r).—The hydration of K_2Na cobaltinitrite depends on pptn. temp., the composition at 60° corresponding with the monohydrate when the ratio $\text{Na}:\text{K}$ in the reagents is 15:1 to 40:1. Co may be determined rapidly using this complex, and for $\text{Ni}:\text{Co} \geq 1$ quant. results are obtained in presence of Ni. Notes on the determination of K as cobaltinitrite and Co as oxine are appended.

Reaction between ammonium salts and cobaltinitrite complexes. I. I. TSCHERNIAEV and J. J. PLAKAN (Ann. Sect. Platine, 1937, 14, 123—156).—The NO_2 -group content of Co complexes can be determined by the method previously described for Pt complexes (A., 1934, 380), taking NH_4I instead of NH_4Cl as the reagent. The reaction is, at room temp., independent of the acidity of the solutions.

R. T.

Organic reagents in analytical chemistry. J. V. DUBSKY and A. LANGER (Chem. Obzor, 1937, 12, 27—32).—The reactions of various org. reagents with Co salts are reviewed. Conditions and in some cases sensitivities are given for the tests.

F. R.

Analysis by means of organic compounds. IV. Volumetric determination of nickel by dimethylglyoxime. V. Separation and determination of nickel and cobalt by means of dimethylglyoxime and sodium anthranilate. VI. Volumetric determination of copper by benzoin-oxime. M. ISHIBASHI and A. TETSUMOTO (J. Chem. Soc. Japan, 1935, 56, 1221—1227, 1228—1230, 1231; cf. A., 1935, 720).—IV. Ni is determined by pptn. with dimethylglyoxime and determination of excess of the latter with $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ as external indicator.

V. The filtrate from the dimethylglyoxime pptn. of Ni is treated with H_2SO_4 , evaporated until it fumes, and the Co pptd. with 3% Na anthranilate.

VI. Cu is pptd. from sulphate solution with α -benzoinoxime, which is filtered and hydrolysed by heating with dil. H_2SO_4 . Excess of Fe alum is added, and the excess determined by manganimetry.

CH. ABS. (e)

Potentiometric studies in oxidation-reduction reactions. III. Reduction with sodium sulphite. B. SINGH and I. I. MALIK (J. Indian Chem. Soc., 1937, 14, 435—439; cf. A., 1937, I, 263).—I, $\text{K}_2\text{Cr}_2\text{O}_7$, $\text{K}_3\text{Fe}(\text{CN})_6$, CuSO_4 , and H_2O_2 can be accurately determined by potentiometric titration with Na_2SO_3 . Details are given.

F. L. U.

Analysis of chromium oxide.—See B., 1937, 1199.

Detection of molybdic acid by fluorescence reaction. L. SZEBELEDY and J. JÓNAS (Mikrochim. Acta, 1937, 1, 46—50).—Molybdic acid gives with cochineal tincture, best at p_H 5.7—6.2, a sensitive brilliant red fluorescence. Most heavy metals extinguish or mask the fluorescence.

J. S. A.

Determination of UO_2 and UO_3 in different layers of a single crystal of uraninite. E. GLEDITSCH and R. BAKKEN (Mikrochim. Acta, 1937,

1, 83—86).—The material was dissolved by heating with H_2SO_4 , and UO_2 was determined by titration with 0.01N- KMnO_4 . UO_3 was reduced, and total UO_2 then titrated. The total U decreases, and the proportion of UO_3 increases, in passing from the core to the outer layer of the crystal. J. S. A.

Electrolytic determination of uranium and its recovery from the filtrate of sodium magnesium uranyl acetate precipitation. M. ISHIBASHI and Y. HARADA (J. Chem. Soc. Japan, 1935, 56, 1234—1236).—Br is added to the filtrate, the solution is filtered, and the U pptd. with aq. NH_3 . The ppt. is filtered, dissolved in AcOH , $(\text{NH}_4)_2\text{CO}_3$ and EtOH are added, and the solution is electrolysed at 60—70° at 6 v. CH. ABS. (e)

Spectral analysis of tin in gold ores.—See B., 1937, 1221.

Volumetric determination of titanium. V. M. SENDEROVA (Trans. All-Union Sci. Res. Inst. U.S.S.R., 1935, No. 68, 85—94).—Titration methods based on the use of KMnO_4 , methylene-blue, and Fe^{III} alum were studied. CH. ABS. (e)

Gravimetric determination of zirconium using disodium methylarsinate. R. CHANDELLE (Bull. Soc. chim. Belg., 1937, 46, 283—300).—Addition of solid $\text{AsMeO}_3\text{Na}_2 \cdot 6\text{H}_2\text{O}$ to solutions of Zr salts in HCl (>0.75N) ppts. $(\text{AsMeO}_3)_2\text{Zr}$ (I). As in traces is removed by reduction after calcinings of (I) and Zr is determined as ZrO_2 , or as (I) or from its As content. The method detects 0.00075 mg. Zr, and is sp. in presence of Al, Cr, Ni, Co, Zn, Mn, Ca, Mg. Modified procedure is described for pptn. in H_2SO_4 or in presence of Fe. I. MCA.

A. Jilek's thiocarbamide reaction for detection of bismuth. J. V. DUBSKY and A. OKAČ (Chem. Listy, 1937, 31, 364).—The reaction given by Bi salts with $\text{CS}(\text{NH}_2)_2$ was described by Jilek (Chem. Listy, 1920, 14, 165) before Sensi *et al.* (A., 1929, 1412). R. T.

Mutual interference in the microchemical determination of ore minerals. H. J. FRASER and R. M. DREYER (Amer. Min., 1937, 22, 949—976).—The interferences in size, shape, or colours of the crystals produced in the NH_4 molybdate, K mercuric thiocyanate, dimethylglyoxime, $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$, CsCl , KI , $\text{KI} + \text{CsCl}$, $\text{CS}(\text{NH}_2)_2$, and Na bismuthate tests are fully described and discussed. Possible interferences by approx. 20 elements have been investigated for most of these tests. L. S. T.

Thermoregulator for direct control of the electric circuit in a heating bath. F. E. HOLMES (Ind. Eng. Chem. [Anal.], 1937, 9, 481—482).—The apparatus is suitable for controlling the temp. to within 1° or 2°. E. S. H.

Improved form of Strache gas calorimeter (explosion calorimeter). W. COURARD (Österr. Chem.-Ztg., 1937, 40, 445—450).—An improved form of the Strache calorimeter (A., 1924, ii, 319) is described; PhMe is used instead of air as the calorimetric substance, and the calorific val. of gases at const. pressure may readily be determined. R. S. B.

Low-temperature studies. II. Comparison of platinum-rhodium resistance thermometers with the helium gas thermometer from 11° to 300° K. R. W. BLUE and J. F. G. HICKS, jun. (J. Amer. Chem. Soc., 1937, 59, 1962—1965).—Pt-Rh alloy (10% Rh) resistance thermometers have been calibrated against the He gas thermometer as a secondary standard of temp. The normal b.p. of O_2 and H_2 and the triple point of H_2 are 90.20°, 20.37°, and 13.94° K., respectively, based on 273.19° K. as the m.p. of ice. An improved form of low-temp. cryostat is described. J. W. S.

Glass-sealing furnace. J. R. DILLEY (Rev. Sci. Instr., 1937, [ii], 8, 394—395).—The furnace described is designed to secure alinement perpendicular to the axis and absence of curvature when sealing end windows to cylindrical glass cells. N. M. B.

Fluorescence microscopy. M. HAITINGER (Chem.-Ztg., 1937, 61, 847—848).—A brief review. L. S. T.

Recent improvements in diffraction gratings and replicas. R. W. WOOD (Nature, 1937, 140, 723—724). L. S. T.

Absorption step-weakensers of antimony. G. O. LANGSTROTH and D. R. McRAE (Canad. J. Res., 1937, 15, A, 154—160).—A method of obtaining a series of graduated steps of known relative intensity with a single exposure for spectroscopic work has been devised. Sb films of uniform optical density are deposited by thermal decomp. of SbH_3 . E. S. H.

Evaporated aluminium coatings for interferometer plates for use in the ultra-violet. J. E. RUEDY and G. B. SABINE (Physical Rev., 1936, [ii], 49, 887).—Films of Al evaporated on Corex and fused quartz have been measured for reflexion and transmission over the range 2380—4080 Å. L. S. T.

New radiation standard. H. KREFFT, F. ROSSLER, and A. RUTTENAUER (Z. tech. Physik, 1937, 18, 20—25).—The construction is described of a high-pressure Hg vapour lamp, running at 250 v., with total radiation, from 2400 Å. to 1 μ., const. to $\pm 2\%$ and const. energy distribution throughout the spectrum. No change was observed after running the lamp for several hundred hr. O. D. S.

Analysis of doubly refracting materials with circularly and elliptically polarised light. R. D. MINDLIN (J. Opt. Soc. Amer., 1937, 27, 288—291).—Mathematical. When the retardation plates are not accurately quarter-wave plates the interference “brushes” are not completely removed and the fringes are not necessarily unchanged. N. M. B.

Violet absorbing filters. P. L. BAYLEY (J. Opt. Soc. Amer., 1937, 27, 303—304).—In order to find absorbers for the violet lines $\lambda\lambda$ 4046 and 4078 when the Hg blue line λ 4358 Å. is used for Raman excitation, gelatin films dyed with β -methylasculetin were prepared under various conditions. No satisfactory absorption at λ 4046 was found. Noviol A or aq. NaNO_3 are satisfactory, and the Wratten 2A film very satisfactory, for both $\lambda\lambda$. N. M. B.

Electrolytic recording of weak electric currents. F. E. LUTKIN (*J. Sci. Instr.*, 1937, 14, 306—308).—Dark coloured permanent records on absorbent paper are obtained by the use of aq. $\text{NEt}_2 \cdot \text{CS}_2 \text{Na}$ or rubeanic acid (I) in EtOH. Contact is made with a Cu or Fe stylus. Traces were obtained with currents of the order 10 μa . or of 1 μa . on the addition of NH_4Cl and NH_4NO_3 to the solutions. (I) with $\text{Pb}(\text{OAc})_2$ is sensitive to 0.5 μa . Precautions regarding resistance of the test paper and electrode contact p.d. are discussed. N. M. B.

High-voltage regulation. P. R. PALLISTER and E. E. SMITH (*J. Sci. Instr.*, 1937, 14, 311—313).—A method utilising the property of induction between two conductors and const. to 0.05 v. at 5000 v. is described. N. M. B.

Portable thermocouple potentiometer. D. R. BARBER (*J. Sci. Instr.*, 1937, 14, 343—346).—The instrument is designed for the range 20—46° with an accuracy of $\pm 0.1^\circ$. E. S. H.

Geiger-Müller counters for radiochemical investigations. F. T. HAMBLIN and C. H. JOHNSON (*Phil. Mag.*, 1937, [vii], 24, 553—571).—Details of the construction and calibration of Geiger-Müller counters are given. K. S.

Correction to be applied to the results obtained by using a Geiger counter. H. TODD [with Appendix by F. T. HAMBLIN] (*Phil. Mag.*, 1937, [vii], 24, 572—582).—The optimum operating conditions are calc. and experimental verification is discussed. K. S.

Counter tubes for the visible region of the spectrum. K. O. KIEPENHEUER (*Z. Physik*, 1937, 107, 145—152).—The use of alkali-metal cathodes in light counter tubes of ordinary design leads to self-excitation by gaseous ions. An apparatus free from this defect is described. H. C. G.

Apparatus for production of radioactive elements by means of radium. F. T. HAMBLIN (*Phil. Mag.*, 1937, [vii], 24, 582—588).—An apparatus for the production of artificially radioactive elements gives adequate protection with ease of manipulation. K. S.

Low-voltage positive ion source. W. H. ZINN (*Physical Rev.*, 1937, [ii], 52, 655—657).—A positive ion source of the low-voltage constricted-arc type, yielding intense positive ion beams with small gas pumping, is described. Ion currents up to 4.3 ma. have been obtained, and magnetic analysis when the arc was operated in H_2 showed a max. of 15—20% protons. N. M. B.

Recording electrochemical meter for determining oxygen [in boiler feed-water].—See B., 1937, 1229.

Improved burette. S. L. PHANSALKAR (*Chem. and Ind.*, 1937, 723—724).—The apparatus consists of a burette and a micro-burette provided with a common outlet and a stop-cock which allows either burette to deliver liquid or connects them together. The liquid level of the large burette is adjusted to scale divisions, where greater accuracy is attainable,

fractions of 1 c.c. being measured in the micro-burette. I. C. R.

[Improved burette.] A. F. H. WARD (*Chem. and Ind.*, 1937, 908).—In the method of Phansalkar (preceding abstract) the accuracy of the titration is only that obtainable with the ordinary burette also employed. R. M. M. O.

Automatic pipette. D. BACH (*Bull. Soc. Chim. biol.*, 1937, 19, 1295—1298).—The arrangement permits the rapid and repeated delivery of a particular vol. of fluid with a considerable degree of accuracy. P. W. C.

Micro-titration by K. Schwarz' method and a micro-pressure pipette. E. ABEL and F. FABIAN (*Mikrochim. Acta*, 1937, 1, 43—45).—Apparatus is described. J. S. A.

Gasometric analysis. J. MALV (*Chem. Obzor*, 1935, 10, 223—226).—A volumeter and a pressure volumeter are described. CH. ABS. (e)

Analytical balance. Sensitivity, weighing, and correction of a set of weights. H. SCHMIDT (*Apoth.-Ztg.*, 1937, 52, 811—814).—Theoretical. F. N. W.

Fume absorber for Kjeldahl digestions. H. G. CASSIDY (*Ind. Eng. Chem. [Anal.]*, 1937, 9, 478—479).—A perforated test-tube containing NaOH - CaO is fastened into the neck of the flask. E. S. H.

Qualitative analysis of microgram samples. General technique. A. A. BENEDETTI-PICHLER (*Ind. Eng. Chem. [Anal.]*, 1937, 9, 483—487).—Apparatus and procedure are described. The chemical operations are performed in cones of 0.5 cu. mm. capacity, prepared from capillary tubing of approx. 0.5 mm. bore. Most of the manipulations are carried out by observation with a low-power microscope. E. S. H.

Microchemical filter crucible. A. J. BAILEY (*Ind. Eng. Chem. [Anal.]*, 1937, 9, 490—491). E. S. H.

Laboratory gas-washing or absorption unit. M. W. BRENNER and G. L. POLAND (*Ind. Eng. Chem. [Anal.]*, 1937, 9, 480—481).—The apparatus uses 20—50 c.c. of absorbing liquid and gives a path of travel of 225—250 cm.; the max. possible rate of flow of gas is 80 l. per hr. The efficiency is illustrated by experiments on the absorption of CO_2 by aq. KOH and of NH_3 by aq. H_2SO_4 . E. S. H.

Self-filling pycnometer. G. F. HENNION (*Ind. Eng. Chem. [Anal.]*, 1937, 9, 479). E. S. H.

Tubular vacuum type centrifuge. J. W. BEAMS, F. W. LINKE, and C. SKARSTROM (*Science*, 1937, 86, 293—294).—An apparatus effective in the separation of liquids is described and illustrated. L. S. T.

Filter beakers in quantitative micro-analysis. F. HECHT (*Mikrochim. Acta*, 1937, 1, 284—286).—An improved construction of micro-beakers is described and their use is illustrated with diagrams. C. R. H.

Fused silica in the laboratory. B. MOORE (*Chem. and Ind.*, 1937, 919—921). J. S. A.

Variable-slit filter for liquids. E. SIMEON (J. Sci. Instr., 1937, 14, 315).—A small filter, in mild steel, is designed to remove dirt particles from Hg.

N. M. B.

Demountable vacuum joint with clamp. S. WEINTROUB (J. Sci. Instr., 1937, 14, 315—317).—Tubes of varying bore and materials are joined with elimination of lateral strain by a special type of clamp, which presses them against rubber gaskets in contact with an annular metal plate.

N. M. B.

Multi-service wash bottle. R. TAYLOR (Ind. Chem., 1937, 13, 394).—The mouthpiece and combined stirrer and water jet are connected by rubber tubing to an ordinary bottle held in a clamp, leaving the hands of the operator free.

A. K. G. T.

Manometer construction for very small pressure differences. E. ROBBELEN (Z. tech. Physik, 1937, 18, 11—14).—A differential manometer with plane-sided capillary and range from 0.0001 to 2 mm. of alcohol is described.

O. D. S.

Apparatus for extracting solutions with heavy solvents. S. WEHRLE (Helv. Chim. Acta, 1937, 20, 927—931).—The solvent is distilled from a flask, the condensate falling in drops through the aq. solution to be extracted contained in the wide limb of a U-tube, the bottom and narrow other limb of which contain the solvent, which is fed back automatically to the distilling flask by overflow through a side tube.

J. W. S.

Equilibria in two-phase, gas-liquid hydrocarbon systems. I. Methods and apparatus. E. H. BOOMER, C. A. JOHNSON, and G. H. ARGUE (Canad. J. Res., 1937, 15, B, 367—374).—Apparatus and technique for bringing a gas and a liquid into equilibrium at any desired pressure up to 370 atm. and temp. from 25° to above 100° are described. Provision for taking samples of known vol. from the

liquid and gaseous phases in equilibrium is made. Procedure for determining phase densities and compositions is described.

E. S. H.

Packed fractionating columns. D. F. STEDMAN (Canad. J. Res., 1937, 15, B, 383—400; cf. B., 1937, 853).—Fine-mesh wire-gauze packings, which give an effectiveness up to 20 plates per ft. of height, are described. Special constructions for laboratory use and for high-capacity apparatus are indicated. The factors influencing the efficiency of packings are discussed and evaluated.

E. S. H.

Hydro-agitator for solutions. L. P. CLEMENTS (Science, 1937, 86, 334).

L. S. T.

Determination of the surface tension of solid substances. R. N. J. SAAL (Chem. Weekblad, 1937, 34, 687—694).—The various methods are discussed critically and it is concluded that trustworthy results are not obtained.

S. C.

Method of stirring gases within a closed chamber. J. W. MITCHELL and W. E. MARTIN (Plant Physiol., 1937, 12, 557—558).—A fan is rotated within the chamber by magnetic coupling with an electromagnet on the outside.

A. G. P.

Determination of viscosity.—See B., 1937, 1142.

Historical studies of the phlogiston series. I. The levity of phlogiston. J. R. PARTINGTON and D. MCKIE (Ann. Sci., 1937, 2, 361—404).

Some eighteenth century ideas concerning aqueous vapour and evaporation. S. A. DYMENT (Ann. Sci., 1937, 2, 465—473).

Fifty years of the chemistry of fluorine. E. EINECKE (Angew. Chem., 1937, 50, 859—864).

J. A. Arfwedson and his services to chemistry. M. E. WEEKS and M. E. LARSON (J. Chem. Educ., 1937, 14, 403—407).

L. S. T.

Geochemistry.

Iodine-air investigations. H. JESSER and E. THOMAE (Z. anal. Chem., 1937, 110, 275—278).—Determinations (in Stuttgart) by Cauer's method (A., 1936, 577) show a mean content of 0.0003 mg. of I per cu. m., the val. increasing before rain or with a westerly wind.

J. S. A.

Bromine and iodine content of water from the Kuibischev region oil-wells. N. D. SMIRNOV (J. Chem. Ind. Russ., 1937, 14, 1222—1224).—The petroliferous H₂O contains Br 12.5—650 and I 0.3—7.5 mg. per litre. Complete analytical data are given for the H₂O from a no. of borings.

R. T.

Chemical character of the ground waters the South Atlantic Coastal Plain. (Miss) M. D. FOSTER (J. Washington Acad. Sci., 1937, 27, 405—412).—The characteristics are described. In general, wells of shallow or moderate depths in Virginia and N. and S. Carolina yield Ca(HCO₃)₂ waters and deep wells yield NaHCO₃ waters. In Georgia and Florida both shallow and deep wells yield Ca(HCO₃)₂ waters.

Disturbances of the general characteristics due to admixture with sea-H₂O are discussed.

C. R. H.

[Analysis of] mineral water from Veneto [Italy]. G. BRAGAGNOLO and B. BRUNETTA (Annali Chim. Appl., 1937, 27, 337—358).—Analytical data for the soil and for the chemical constituents, physico-chemical characteristics, dissolved gases, and radioactivity are tabulated.

F. O. H.

Native copper of the Allaverdi [Armenia]. O. E. ZYJAGINTZEV and E. L. PISARSHEVSKAJA (Bull. Acad. Sci. U.R.S.S., Ser. Chim., 1937, 675—680).—The Cu contains Cu 97.20—97.46, Fe 0.25%, and Ag, V, Sb, Si, and As traces, and consists of polyhedra of Cu with inclusions of cuprite. The hardness approximates to that of electrolytic Cu.

R. T.

Application of clay mineral technique to Illinois clay and shale. R. H. BRAY, R. E. GRIM, and P. F. KERR (Bull. Geol. Soc. Amer., 1935, 46, 1909—1926).—Examples of the examination of clays and shale are described.

CH. ABS. (e)